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ORIGINAL ARTICLES

THE RESULTS OBSERVED IN A FURTHER STUDY OF PRENATAL CAUSES OF DENTOFACIAL DEFORMITIES*

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"Scientific thought is not an accompaniment or condition of human progress, but human progress itself."—Clifford.

KARL PEARSON[1] in his conclusion respecting the claims of science says: "For the present, then, it is better to be content with the fraction of a right solution than to beguile ourselves with the whole of a wrong solution. The former is at least a step toward the truth, and shows us the direction in which other steps may be taken. The latter can not be in entire accordance with our past or future experience and will therefore ultimately fail to satisfy the esthetic judgment. Step by step that judgment, restless under the growth of positive knowledge, has discarded creed after creed, and philosophic system after philosophic system. Surely we might now be content to learn from the pages of history that only little by little, slowly line upon line, man, by the aid of organized observation and careful reasoning, can hope to reach knowledge of the truth that science, in the broadest sense of the word, is the sole gateway to a knowledge which can harmonize with our past as well as with our possible future experience."

It is then only through scientific investigation that the traditions regarding the relative relation of the dental arches, occlusion and their perversions can give way of tested truths. In orthodontia some real progress has been revealed to obscure questions during the past few years, it matters little if some of the determinants have not yet been discovered, nor if from the limited experience of our observations we failed to cover all the problems.

*Read before the Seventeenth Annual Meeting of the American Society of Orthodontists, Excelsior Springs, Mo., Sept. 5, 1917.

Last year in Pittsburgh I had the pleasure of presenting before this society the results observed in my examination of embryos and fetuses,[2] and at that time showed there were definite malformations, as well as malrelation of the dental arches, prior to and at birth, and a few of the probable factors that were influencing the development of the facial area.

Unfortunately this paper was read just prior to the close of the meeting, preventing a full discussion. For that reason I earnestly hope that this subject will be thoroughly discussed at this meeting, as I consider the question of sufficient importance to again bring it before this society. In case there is no discussion, it will at least place before you some facts that might cause you to hesitate and ponder over before beginning the treatment of orthodontic cases.

At this time I will present further evidence to prove we have conditions that are of prenatal origin, irrespective of what a few of you might care to accept, and that we have merely scratched the surface of the etiology of malrelation of the dental arches and malocclusion. While mechanics in orthodontia has its place, if we are scientific orthodontists we should and *must* give more attention to the etiologic conditions we are handling.

That this problem is a serious one has been fully proved this past winter by men engaged in sister professions, especially those in pediatrics and infant feeding.

As I endeavored to explain last year, most of the material published so far in both the dental and medical textbooks concerning the "normal" skull at birth is inconsistent and contrary to careful observations, consequently misleading students and causing false conclusions. We have accepted these statements as true, neglecting to observe these things for ourselves, and thus we find we have been working from the wrong hypothesis and accomplishing little so far as etiology is concerned.

As the paper read last year was published in the November issue of the *Dental Items of Interest* you are undoubtedly familiar with it; nevertheless, I shall take the liberty of reviewing part of it.

The etiology of malformations depends either on internal causes or upon the action of external influences; thus etiologic conditions consequently depend upon one of the following three causes.

1. Direct family heredity, not only of the parents, but from the ancestors as well.

2. Pathologic. Not only disease, but all that pertains to it. Results are marked by irregularities.

3. Mechanical. Neither healthy nor pathologic.

"A malformation is generally defined as an alteration occurring during fetal development; i. e., a congenital alteration of one or more organs or systems of organs, or of the whole body, which does not come within the range of variation of the species."[3]

Nearly all malformations (embryonic and fetal) originate in the first six weeks of intrauterine life, or the embryonic period, and *"when the malformed embryo becomes a fetus, it carries whatever malformations it has into the*

fetal period, and is born with same."[4] Congenital malformation, therefore, is not always the product of late, but of early, uterine pathology.

Variations in the bones of the adult human skeleton are due to the chance persistence of transitory condition normally present in the embryonic or fetal skeleton and supposedly of phylogenetic importance. Studies show that the skeleton of the embryo is subject to fluctuating variations similar to those of the adult.

However, certain factors must be borne in mind as influencing the further growth and development of the individual. The form of the skeleton as a whole and of the individual bones which compose it may depend partly upon heredity, partly upon pathologic, and partly upon the mechanical or chemical influence to which it is subject during growth.

Mendel,[5] in speaking of the factors which determine the possibility of growth, says: "The factors which determine the possibility of growth, and upon which, therefore, any broad generalizations, regarding the abnormalities of growth, must be based, may be classed, with respect to the organism involved, as internal or external in character. The internal factors include the real impulse to grow, of whatever nature it may be; in part they are inherited, they belong to the permanent biological characteristics of the individual. Heredity, with all that it involves, determines the most potent of these internal, constitutional incentives and conditions of growth. These are the determinants which are largely beyond our immediate control, yet must be reckoned with when defects of growth appear. The external factors that modify growth, on the other hand, are more amenable to directive regulation. The environment of the individual can be modified more or less at will.

"In order to have a common basis for the discussion of the abnormalities of growth, some definition is essential, difficult though it may be to formulate one in entirely satisfactory terms. Even when the body as a whole no longer gains in size, individual parts like the hair and nails may continue to grow. It will be preferable to speak of such phenomena of localized growth as a renewal of tissues, and, likewise, to exclude from the category of real growth the deposition of fat and other reserve materials that often produce a gain in weight. 'Increment in size' or 'gain in weight' or 'enlargement of mass' are inadequate descriptions of the more specific characteristics of the growth of the higher forms. I have found no more helpful concise definition than that by Schloss[6] who characterizes growth as 'the correlated increase in the mass of the body, in definite intervals of time, and in a way characteristic of the species.'

"Perfect growth and development implies a far-reaching correlation of the various parts of the body. An upset in this nicely balanced relationship is speedily recognized as an anomaly. Energy and matter are sufficient to explain the comsummation and maintenance of a normal as contrasted with an abnormal composition of the cells. The specificity of growth is something marked, particularly when normal is contrasted with perverted growth. The definition referred to above has a particular value in the analysis of abnormalities of growth, because it immediately suggests some of the anomalies of irregularities. Abnormal growth may involve (1) the correlation feature, or (2) a time factor whereby the characteristic rate of the increase in mass is not maintained. The

correlation refers, for example, to the arrangement of matter in respect to composition and likewise to form. When there is overgrowth of one part or under development of another, the correlation is upset. This is abnormality. Likewise when the change in size is well proportioned or correlated, but unduly delayed or prolonged, growth becomes abnormal in its rate for the individual under consideration."

Fig. 1 shows a series of human embryonic skulls from the second month to the ninth month, front and side views, and illustrates the gradual growth of the skull. The relatively small size of the maxilla is a cause of the small dimensions of the fetal face, but at birth the maxillary sinus, which is only a slight depression on the medial surface, extends laterally into the maxilla and gradually enlarges until dentition is complete. As this maxillary sinus increases in size, the alveolar process develops and with the development of the teeth, brings about the growth of the maxilla mandible, and the corresponding parts of the face.

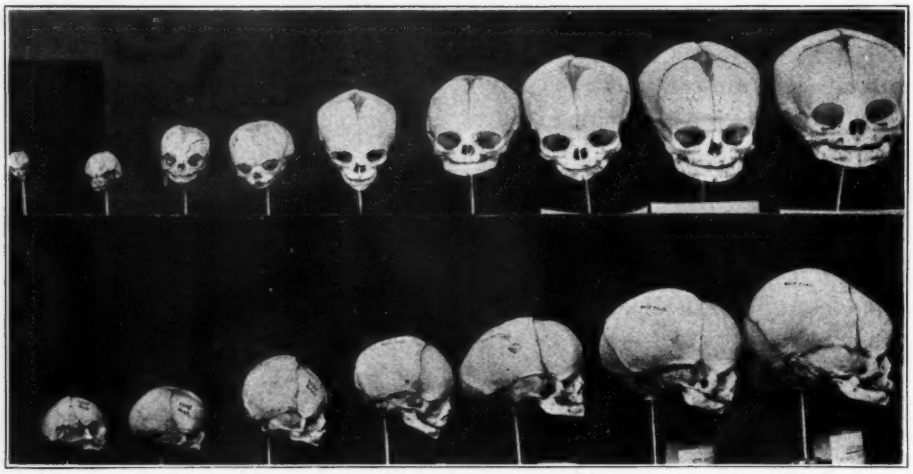

Fig. 1.—Series of embryonic skulls the end of the second month to the ninth month. Front and side views, illustrating the gradual growth of the skulls.

Fig. 2 shows the extensive coiling toward the ventral surface with the gradual uncoiling. First the trunk straightens out and the nape bend slowly becomes obliterated. This is accomplished by a rapid growth of the ventrally situated organs, especially the heart. With the straightening out of the nape bend, opportunity is offered for the formation of the neck.

The evolution of the face must depend upon the enlargement and fusions of the oral and nasal cavities, upon the partial separation of those cavities; leaving the posterior nares open, and upon the growth and specialization of the facial region of which the development and elongation of the maxilla and mandible is the most conspicuous indication. While this is occurring, there is a modification of the position of the face in relation to the brain, cranium, and heart. As the oral region develops, the extensive coiling of the embryo begins to straighten out and the heart descends.

Here I desire to bring to your attention a skull Cryer showed last year,

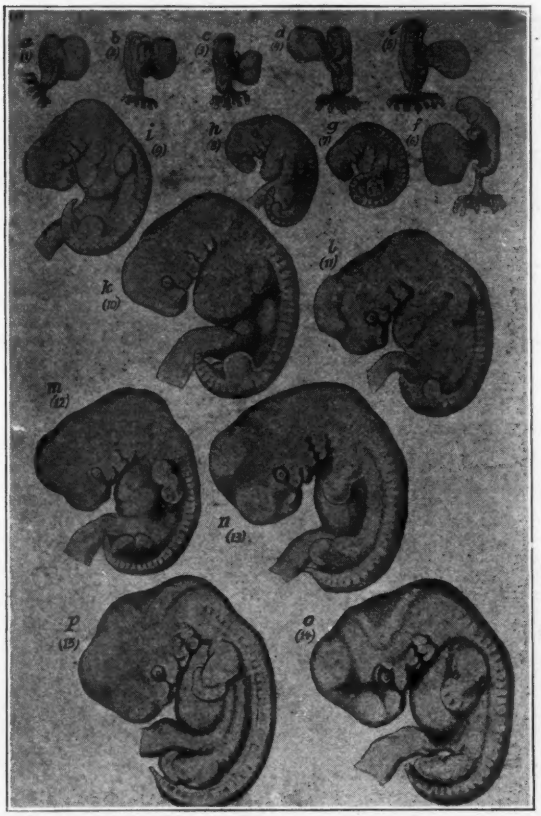

Fig. 2-*A*.

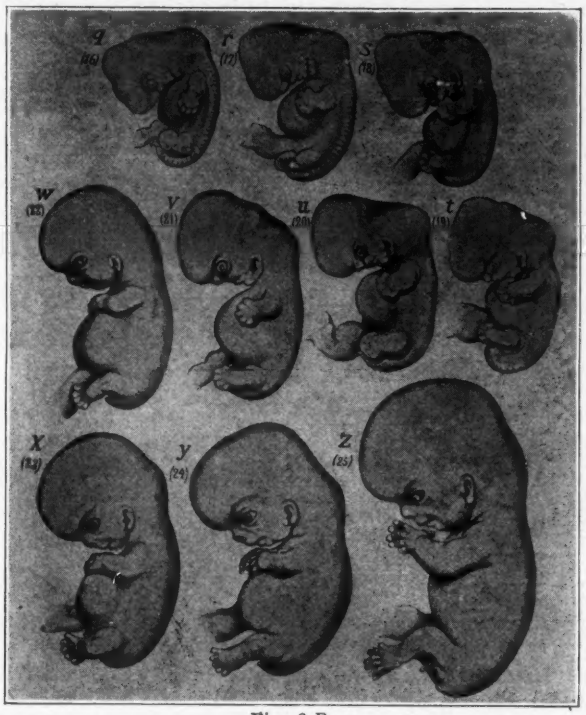

Fig. 2-*B*.

Fig. 2, *A* and *B*.—Development of the human embryo, showing the extreme coiling and gradual uncoiling of the embryo and fetus. (His's Noremtafel.)

an illustration of which is to be found in his second edition of the "Internal Anatomy of the Face," which I believe to be an abnormality, and not a "normal transverse section of a child's head at birth."

Fig. 3 is the skull of a fully developed embryo cut vertically through the first deciduous molars. Cryer, in describing this skull, says "the lower jaw is developed slightly in advance of the upper, * * * if a vertical line is drawn through the center of the tooth germs and the alveolar process of each jaw, it will be found that the lines of the upper jaw are on the inner side of those of the upper, the difference being one-half the thickness of the lower jaw, * * * as the teeth erupt, the lower acts as a matrix upon which the upper

Fig. 3.—Skull of a fully developed embryo cut vertically through the first deciduous molars, the orbit and nasal chambers. (Cryer.) This skull shows the mandible developed in advance of the maxilla. An abnormality.

is formed, and we find the upper teeth one-half a tooth buccally over those of the lower."[7]

In examining a half dozen dissections of frozen fetal skulls I have failed to find one case in which the mandible was developed in advance of the maxilla, but, on the contrary, all show this development to be the same as in adult life (Fig. 4).

I firmly believe that the skull Cryer showed is an abnormality, and it only strengthens my previous conclusions that we have abnormalities to contend with prior to birth.

Having observed malrelation of the dental arches as early as the fourth month of fetal life, it will be necessary to consider the factors affecting early malrelations. At the Pittsburgh meeting I dwelt at some length upon the third

cause, namely, mechanical, i. e., amnion pressure. This I will review briefly. Of all the known causes, the pressure exerted by the uterus and the fetal membrane, as a result of a deficiency in the amount of liquor amnii, is undoubtedly the most significant. The damage caused by this condition manifests itself mainly in the extremities and according to the view of Jansen[8] and others, anomalies of the amnion play the most important part in the early production of malformations, and are today considered of the greatest importance.

As stated, it is during the germ-cell period that the first rudiments of the individual are laid down. Surrounding the embryo and within the outer surface is found the liquor amnii varying considerably in amount.

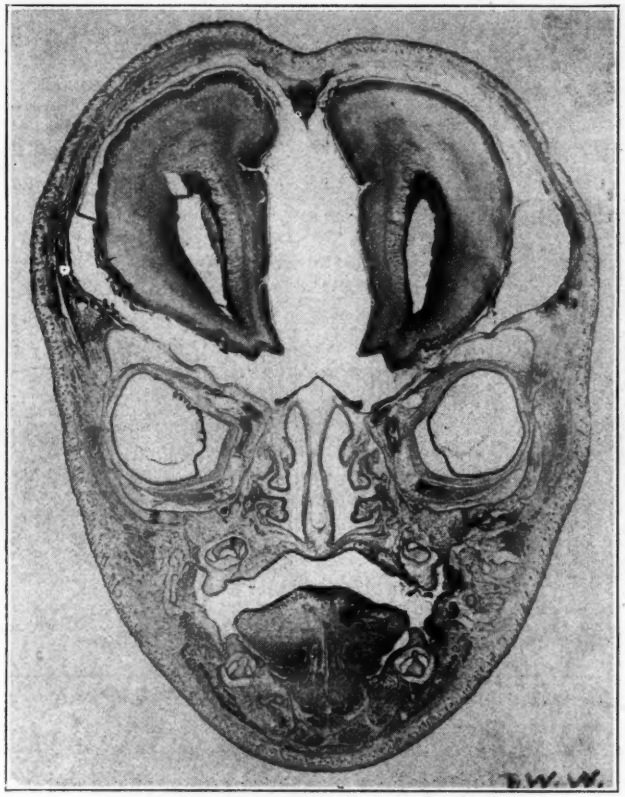

Fig. 4.—Frozen section of a skull cut vertically. Here we find the same relation between the mandible and the maxilla as in adult life.

The study of the mechanical malformations shows that the normal head bend of the fetus is accentuated by external forces or pressure, that pressure on the head curve must push the region of the branchial arches and the future face against the organs of the chest and chest wall, causing the floor of the mouth to approach the roof of the primitive bucco-pharyngeal cavity. From this we can readily see that there is hardly any part of the infolded embryo that is more exposed to the dangers of increased pressure than that in which the branchial arches are squeezed against the chest wall. This pressure interferes with the blood supply, causing a disturbance in circulation, a temporary disturbance in nutrition, and a stunting of growth of the part affected.

The following figures from the above work clearly illustrate the theory of amnion pressure. Fig. 5 shows "mesial section through basis cranii and face of

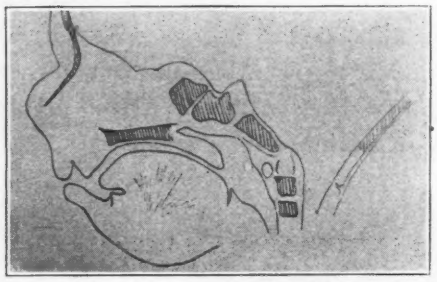

Fig. 5.—Mesial section through base of cranium and face of normal fetus. (Kaufmann, from Jansen.)

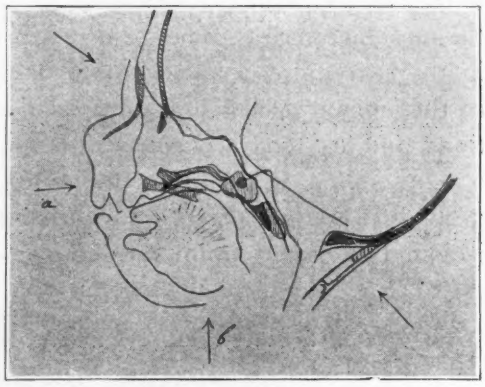

Fig. 6.—Kaufmann's fetus VI laid together with the normal, Fig. 5. Pressure during fetal life has acted in the direction of the arrows *a* and *b*. Light lines are normal, dark are abnormal. The hard palate is displaced backwards and bent.

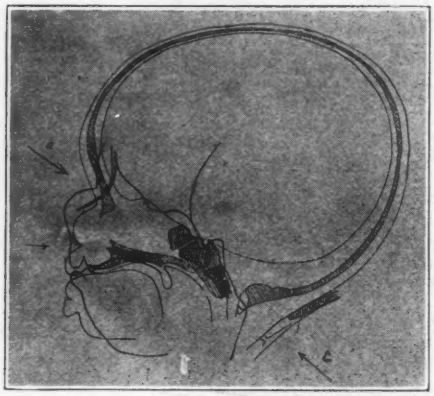

Fig. 7.—Base of the cranium of Kaufmann's fetus I, laid together with the normal (light lines) mandible pushed forward. Pressure here is in the direction of the arrows *a* and *c*.

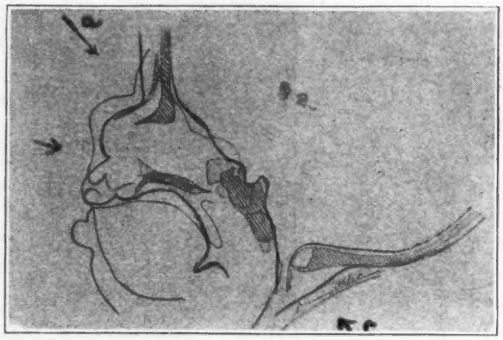

Fig. 8.—A similar condition to that shown in Fig. 7. Direction of the arrows *a* and *c*.

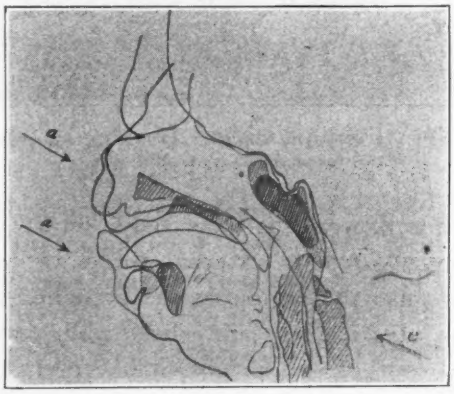

Fig. 9.—Outline of a frozen section in a normal (light lines) and abnormal fetal skull. Pressure here has been in the direction of the arrows *a* and *c*. The base of the cranium is shortened and the mandible displaced backwards, as well as the hard palate.

normal fetus" (Kaufmann) the outline of which is placed parallel to the mesial sections of Figs. 6, 7, 8, 9. In Fig. 6 we find a mechanical pressure has acted

upon the face in the direction of the arrow *a*, which has pressed both the nose and the hard palate backward. The parts of the mouth have been squeezed between the base of the skull behind and some compressive influence in front. This pressure has also changed the direction of the palate; its posterior position has been tilted upwards, so that the angle which it forms with the basis cranii has been made greater than normal, indicating that under the chin a similar mechanical pressure has been at work, in the direction of the arrow *b*. The very same phenomena are visible in Figs. 7, 8 and 9. The sagittal dimensions of the mouth cavity are reduced, moreover the profile line of the lower jaw appears to be pushed inward, showing that an abnormal pressure against the jaws has acted in a backward direction."

The table shown in Fig. 10 admits of a survey of the above facts.

AMNION PRESSURE IS ABLE TO CAUSE:		The mechanical malformations are attended by phenomena of stunting in growth or even of destruction.	During the development of these disturbances the skeleton is in the stage of the:
	mechanical malformations of the embryo:		
during the 1st and 2nd weeks	a wrinkling of the embryonic axis.	destruction of ecto- and mesodermal elements (anencephaly).	mesoderm, 1st stage.
during the 3rd — the ± 6th week	infolding of the embryonic axis.	stunting in growth (achondroplasia).	scleroblastema, 2nd stage.
during the ± 6th — the ± 8th week	Compression or curving of the extremities.	kakomelia in which bones are lacking (hemi-ectromelia, oligodactyly and others).	scleroblastema of the extremities, cartilage and bone of trunk ↗ ↘
after the ± 8th week	(The embryonic axis remains intact.)	kakomelia with the normal number of bones (club-foot).	cartilage and bone of the extremities 3rd stage.

Fig. 10.—Table illustrating what amnion pressure is able to cause. (Jansen.)

Mechanical malformations affected by amnion pressure are characterized by two groups of phenomena-interference with growth, and mechanical malformations. Thus we find the region of the dental arches can be either partly or wholly compressed mechanically and the hard palate displaced in the direction of the base of the skull.

Having observed the effects of mechanical pressure on the face, let us now consider a *normal* skull. Fig. 11 is the skull of an infant of six months. The deciduous central incisors have erupted and are in occlusion. The position of the mandible is normal.

Fig. 12 shows the normal relation at birth, while Figs. 13, 14, and 15 show a few of the variations found.

That we have abnormal relations of the dental arches at or prior to birth can no longer be a disputed question with a consequent malocclusion of the deciduous teeth.

Now what do the examinations of these illustrations reveal upon close inspection? Hellman reported some years ago "that a great majority of our cases were bottle-fed children and that malocclusion of the teeth is found to be intimately related to conditions that interfere with normal breast feeding."[9] The result of my investigation only strengthens his contentions and proves we must go even further back than this, for bottle feeding is only the result and not a direct cause. A great majority of our patients were "raised on the bottle," but why?

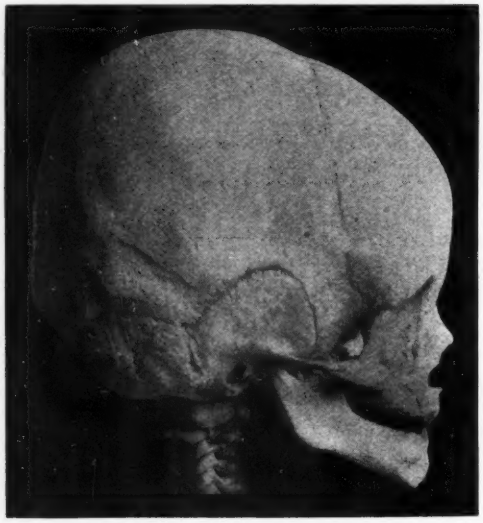

Fig. 11.—Normal skull of infant of six months. Note relation of maxilla and mandible.

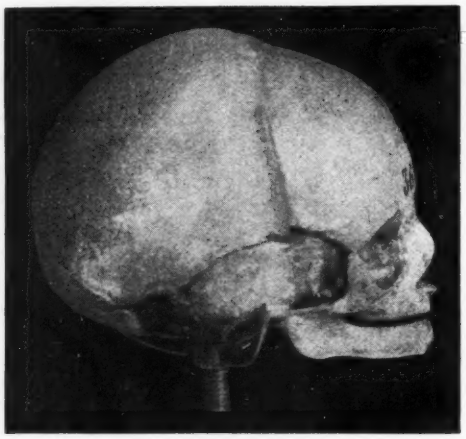

Fig. 12.—Normal relation of the mandible at birth.

During development the skeleton is markedly influenced by internal chemical conditions, internal secretions, affecting growth or general nutrition of the body and in some cases seems to be the part primarily affected. This is the next great step in orthodontia that must be investigated and one we will undoubtedly have to undertake ourselves.

Defective bone growth is undoubtedly concerned in a variety of abnormalities of development. A quotation from McCrudden[10] may serve to illustrate

some of the problems involved. "Another kind of condition in which bone growth is involved is dwarfism. The causes are probably many. But in one type I have observed a disturbance of calcium metabolism associated with improper development of bone. Calcium is almost absent from the urine, leading to the belief that the blood must be poor in calcium or contain it in some unusual combination. The feces are very rich in calcium, containing sometimes more than the food. There is, in fact, a flux of calcium through the feces. And in these cases the long bones fracture easily and roentgen ray examination shows a very thin cortex. In other types there are no abnormalities of this kind. Now, as pointed out by Rubner,[11] we can imagine two fundamental causes for the lack of growth: (1) the lack of what might be called the tendency to grow, that property which is present in young animals, but absent in adults; and (2) the absence of the material for growth. And it seems to me that in these two types we have examples of disturbances of each of these two factors. In the one the skeleton is growing as fast as the material at its command permits. We might also say that it is growing too fast, for it is growing in length at the expense of solidity. In the other there is no such tendency to grow. There is calcium enough present to form longer bones, but there is no tendency to form them. And this kind of disturbance of bone nutrition we may refer to as a quantitative change, for the bones fail to grow in size. There are two large subdivisions of this type * * * one in which the tendency to grow is absent, the other in which the material for growth is not available."

Mendel then states,[12] "There is occasion to believe that the growth of bone in the young is only one of the developmental processes under the physiologic dominance, so to speak, of the endocrine or ductless glands. The thyroid, thymus, ovary, testis, hypophysis and others, furnishing inhibitory, as well as facilitating factors, may be involved. The effects of removal or loss of function of some of these glands upon growth are being investigated in a more systematic manner.

"It will be noted that the interferences with normal growth may be constitutional, or internal, in some of these manifestations of abnormalities of correlation, and external or seemingly associated with alimentation in other cases. It is not yet possible to distinguish clearly between cause and effect.

"It is too early to draw any sweeping conclusions from the already extensive literature on the ductless glands; but one may look forward with confidence to interesting developments in this field of the physiology and pathology of growth. Future investigation may show that directive influences in growth reside in the endocrine glands to an extent scarcely realized at present; possibly it will be found that the correlative factor which has been emphasized in this review is closely bound up, even more closely than can now be appreciated, with the proper growth and development of such special tissues."

Recently Kirk[13] in a paper entitled, "Malocclusion as a Problem in Pathology," quoted from Williams, saying: "That the thyroid secretion is essential to the development of the fetus is shown by several facts. * * * It is normal for women during pregnancy to develop an enlargement of the thyroid

glands, which subsides rapidly after the child is born. By no means the least important function of the thyroid gland is that of fixing the calcium salts in the body. In order to permit of bone formation in the fetus, the mother is obliged to provide more secretion than under normal circumstances she requires, and the gland consequently hypertrophies. After the birth of the child, the increment being no longer necessary, the gland resumes its usual proportions. *In some women this prolonged call of pregnancy has the effect of unduly exhausting the gland, and they are unable in consequence to suckle the child, for lactation is dependent upon a due supply of thyroid secretion.* Such women generally become obese and lethargic, and remain so for varying periods until the thyroid has had time to recover itself. Judicious thyroid medication will frequently not only enable a mother to suckle her infant, but will materially shorten the period of her postpartum difficulties.

"Now with regard to rickets I feel in a position positively to affirm that if all the symptoms of the disease are not due to thyroid insufficiency, then certainly its most salient features are. Especially does this apply to the bony phenomena which characterize its outward seeming. These phenomena are obviously due to inadequate osseous development, and as in the fetus, so in the growing infant, thyroid secretion is essential to the full utilization of the calcium salts. It is known that the bony phenomena are due to a relative absence of calcium salts, and it is also known that these salts, given in large excess though they be, have no influence in arresting the disease. This is because the all-essential link is missing, the thyroid secretion, by whose means alone the ingested calcium can be so assimilated as to be incorporated in the osseous tissues. I claim no originality for this view as to the essential factor in rickets. It was first advanced by Professor Marfan, in 1907, and upheld in an interesting paper which does not appear to have attracted the attention which it deserves. My own experiences have convinced me that this view is correct. If it be true anywhere, as the adage has it, that *Naturam morborum curationes ostendunt,* it is preeminently true in the sphere of opotherapy, and every case of rickets in which I have employed thyroid extract has shown such decided improvement as to leave no doubt in my mind that thyroid insufficiency is the main causative factor in the disease.

"As a child progresses in years, deficiency in thyroid secretion may reveal itself in various ways. * * * In the same connection I discussed the question of adenoids, and made so bold as to suggest concerning them, that they constitute one of the stigmata of thyroid insufficiency.

"Adenoids and enlarged tonsils occur in children who have an inadequate supply of thyroid secretion. The hypertrophic condition in each case is apparently the result of an endeavor on the part of the organism to supply an internal secretion as nearly allied as possible to the one which is lacking. If the hypertrophy is not very pronounced, and if it has not been very long in existence * * * great enough and protracted enough, that is, to produce complications such as disease in the tonsils themselves or in the ears * * * then the exhibition of thyroid extract will cause their regression. It is only

when medical means have failed that operative interference becomes justifiable." This certainly confirms the conclusion of McCrudden.

As to bottle feeding being the cause of malocclusion of the teeth, Hellman later modified his previous conclusion by stating, "Malocclusion of the teeth is found to be intimately related to conditions that interfere with normal breast feeding. * * * It may therefore be concluded that of the numerous factors that enter into the etiologic problem of malocclusion of the teeth, *internal secretions* is the one which may in a large measure account for many mysteries that perplex the orthodontist."[14] In discussing Kirk's paper this same investigator states:[15] "Some years ago I began the study of the etiology of malocclusion.

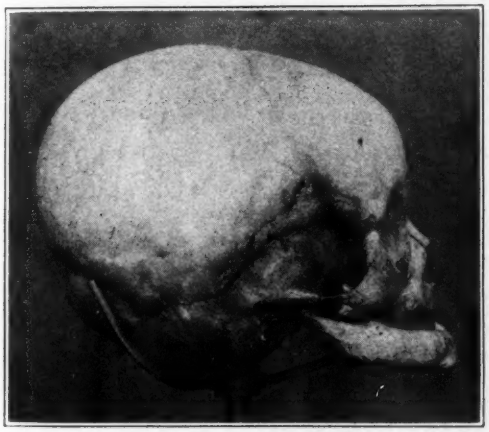

Fig. 13.

Fig. 14.

Fig. 15.

Figs. 13, 14, and 15.—Series illustrating a marked disturbance in development at birth.

I started, as Dr. Kirk said, from the viewpoint of orthodontia. This was done by making the nipple of the bottle-fed baby the bone of contention, but after I had pursued this study for a while, the subject broadened out beyond the nipple, and beyond orthodontia, extending into medicine, and probably into biology. So that the fact of the matter as it stands today is exactly as stated by Dr. Kirk. By experimentation it was found that insufficient thyroid secretion is the cause of disturbances in lactation. This has been proved over and over again by clinical observation also. On account of the inability of the mother to secrete milk and nurse her offspring, most of these children have to resort for their maintenance to the bottle."

We thus find here one of the reasons for the great percentage of "bottle-fed babies." There is one factor, however, we all have overlooked which I believe must be seriously considered before holding the mother entirely accountable in all cases for this condition. This winter I have endeavored to observe in various institutions the relation of feeding to malrelation of the dental arches and I discovered a fair percentage of infants unable to nurse, not on account of the condition of the mother's inability to secrete milk or nurse her offspring, but where the infant was compelled to resort to the bottle to obtain nourishment owing to the malrelation of the mandible preventing proper breast feeding. (Fig. 16, see also Figs. 13, 14, 15.) Whichever of the underlying causes it may be, each has the same common origin.

Falta[16] in his "Ductless Glandular Diseases" shows that the endocrine organs have a direct bearing on the oral cavity and the teeth, we are now only beginning to realize to what extent. He states:

"Disturbances in dentition go hand-in-hand with those of growth of the bones. When the thyroid gland is entirely absent, the children during the

Fig. 16.—In both these cases it was not on account of the mother's inability to secrete milk or nurse her offspring that compelled the use of the bottle, but was due entirely to the distoclusion of the mandible.

first year remain completely toothless. In the latter years the milk-teeth develop very slowly and finally remain partially retained. (Often in addition to the retained milk-teeth are found the rudiments of the permanent teeth.) Here thyroid therapy, as we shall see later, may elicit excellent results.

"Of quite a manifold nature are the findings as to the teeth of cretins. Kranz examined thirty cretins from the Knittelfeld Institute in Steiermark as to jaw and tooth formation, and found numerous anomalies of the jaws, retarded teething, and factors giving rise to anomalies of the position of the teeth. Further, he commonly found alteration of the structure, defects of the enamel, hypoplasias and erosions and very frequently caries.

"Of recent date are the investigations concerning the disturbances in tooth formation. Erdheim first observed that there occurred in rats, one and one-half to two and one-half months after the operation, opaque spots on the anterior surface of the incisor teeth which gradually advanced toward the points with the teeth's growth.

"Erdheim observed a deficient calcification of the dentine. Even the short

cessation of parathyroid function that occurs in autotransplantation of the parathyroid is sufficient to determine the appearance of stripes poor in calcium in the dentine of young rats. A special clinical interest to Erdheim's studies is given by the investigations of Fleischmann. This worker held the view that the defect of enamel so commonly observed was due, not as was formerly supposed, to rachitis, but to tetany. He points to the disproportion between the frequency or rachitis and hypoplasia of the enamel. In rachitis are regularly found alterations in the dentine; in tetany, however, one always finds hypoplasia of the enamel leading to the formation of horizontal transverse surfaces. When frequent exacerbations of the tetany have occurred, are found numerous furrows below one

Fig. 17.—Overdevelopment of maxilla and mandible with marked spaces between the cuspids, premolars, and molars.

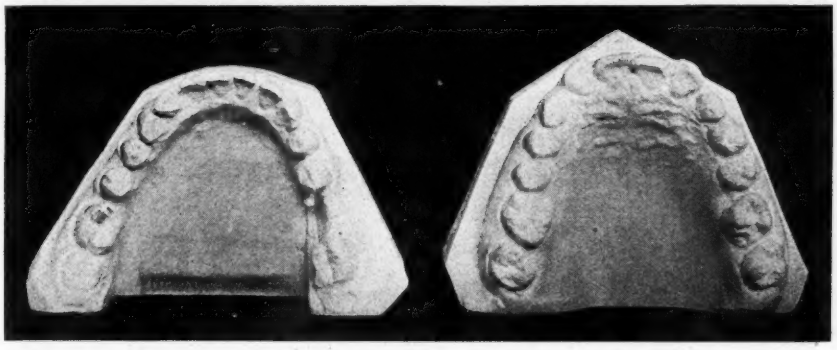

Fig. 18.—Similar to Fig. 17 with spacing between all of the teeth, upper laterals missing, both deciduous and permanent cuspids present.

another. Fleischmann investigated ten children who had suffered from tetany and found in all the above mentioned hypoplasia, and indeed this was present only on those teeth that had been present during the course of the illness. Nearly all of the children had also had rachitis. Fleischmann points out, however, that rachitis lasts much longer than tetany, and also attains its acme much later. Fleischmann also finds support for his view in the statement of Fuchs that children with lamellar cataract almost always show hypoplasia of the enamel. In individuals with hypoplasia of the enamel, in whom nothing is known of their having had tetany, there may have existed a latent tetanic condition in early childhood. Very convincing is an observation of Spiegler in a case of recurring tetany that had an attack every spring during eight years. In this case it was

known that the tetany had first made its appearance at the end of the second year of life. All teeth whose crowns must have been formed at this time were normal, while the teeth whose crowns developed later showed defects of the enamel. An entirely similar case was observed by Kahn and myself (Observa-

Fig. 19.—Overdeveloped maxilla and mandible.

Fig. 20.—Increased bone growth in both dental arches.

Fig. 21.—Progressive case. Same case, age 10, 13, and 14 years, showing increase of bone growth and spacings between the teeth. Peculiar undersized-shaped premolars.

tion XXIII.) Here were found on the canine and incisor teeth punctiform defects of enamel often arranged in parallel rows; the upper parts of the molars were partly broken off.

"The connection between tetany and defects of the enamel is by all this evidence put on a sound basis; and I shall not discuss the possibility of these defects being brought about by other causes."

The details of the following few cases I will leave for some other paper. In order to bring home to you all this question of internal secretion and its effect on malocclusion of the teeth and to enable you to observe these facts for yourself, I will show you a number of cases from my own practice. I trust all will in the future observe these facts and record them, so that we may arrive at some definite conclusion. Without the help of everyone, those interested in this work will be handicapped, and unable to make much progress.

Case 1.—Both the mandible and maxilla are overdeveloped, with marked

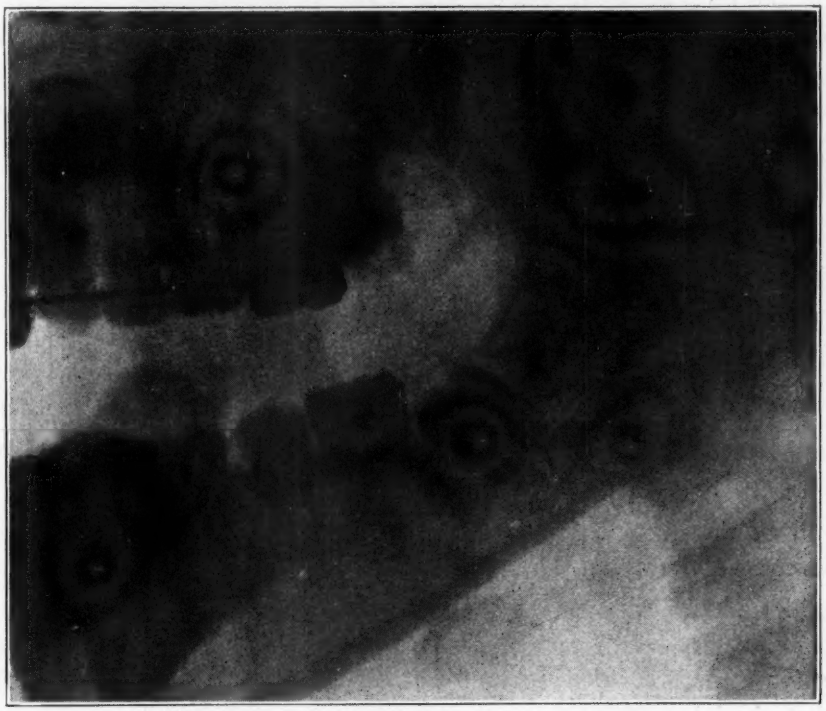

Fig. 22.—Delaved eruption of upper second premolar, 14 years old, due to unequal absorption of the deciduous roots. These delayed dentitions can, in nearly every case, be traced to the same cause. This also shows the increased bone growth in the mandible. Models shown in Fig. 21.

spaces between the cuspids, premolars and molars. Female, age 15. (Fig. 17.)

Case 2.—Similar condition. Missing upper laterals. Upper and lower deciduous cuspids retained. All permanent cuspids present. Female, age 25. Two sisters show the exact conditions. Brother normal. (Fig. 18.)

Case 3.—Increased spacing between all the upper teeth including deciduous molars. Spacing between lower premolars. Female, age 13. (Fig. 19.)

Case 4.—Increase of bone growth in mandible between cuspids and premolars. Female, age 11. (Fig. 20.)

Case 5.—Same case, three years and one year apart. Gradual increase of both the maxilla and mandible. Peculiar shaped lower premolars, upper extremely small occupying half of the space of the deciduous molars. Female,

10, 13, and 14 years. (Fig. 21.) Delayed dentition due to unequal absorption of the deciduous molars, thereby preventing the tooth from falling out. Figs. 22 and 23, a series showing teeth that had to be extracted as they were held in place owing to unequal absorption of the roots. The one on the extreme right is shown in Fig. 22.

SUMMARY

Every case shows an increase of bone growth in the premolar region, with the exception of Case 5, all present an early permanent dentition. Another peculiar fact is that all cases so far observed are in females, with the increase of development taking place at puberty. This is undoubtedly due to sexual conditions, as the period of adolescence was reached in every case earlier than the average girl. We thus find a peculiar association between mandibular and maxillary growth, age, puberty, and sex. A more striking factor and the one that is of the most interest to us is that this abnormal condition showed itself first through the teeth, and upon a thorough investigation established the fact

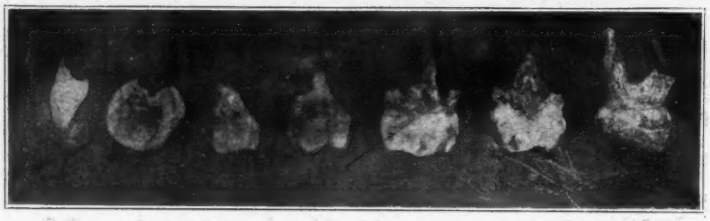

Fig. 23.—A series showing teeth that had to be extracted owing to unequal absorption of the roots. The one on the extreme right is shown in Fig. 22.

that in all of the above cases one or more of the ductless glands were found to be secreting abnormally.

Figs. 24 and 25 are two skulls of infants about nine months old illustrating a great irregularity in the order of development of teeth. Associated with this irregularity is an abnormal relation of the dental arches. Both skulls show that rickets had been present, and from what has already been described, we know that this disease is now closely associated with the ductless gland.

This illustrates how closely related the teeth are to the other structures of the body and emphasizes the fact that greater cooperation between the orthodontist and the medical profession is necessary if we are to obtain results.

Before concluding I desire to bring to your attention the question of adenoids and tonsils. Here again I believe we are being misled as well as misleading others, by accepting the theory that adenoids and tonsils cause malocclusion and malrelation of the dental arches. We have not studied this question thoroughly enough and have been led blindly into making the above statement. Have we not put the "cart before the horse?" By examining Fig. 26 that if the mandible is in distoclusion the tongue must be pushed upward and backward into the posterior part of the oral cavity thus causing an abnormal pressure in that region especially against the adenoids and tonsils. These organs, having

already hypertrophied through congenital constitutional causes, are increased in size. Whatever the constitutional cause that brings about the distal or mesial occlusion of the mandible, no doubt, also produces a pathologic condition of the adenoids and tonsils, therefore, mesial or distal occlusion or maloc-

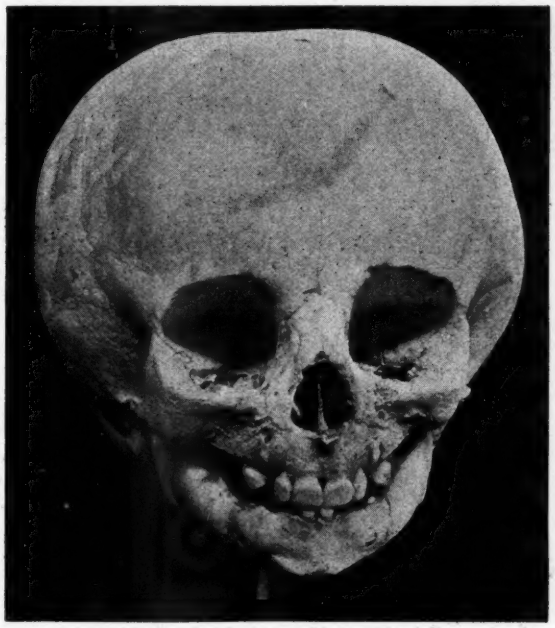

Fig. 24.—Skull of infant nine months of age, showing great irregularity in the order of development of teeth, the upper having erupted in advance of lower.

Fig. 25.—Skull of infant about eight months old. Protruding mandible, median line shifted. Upper left and lower right erupted prior to the right and left sides. Rachitic child.

clusion of the teeth is not the result of adenoids and tonsils. Let us once and for all lay aside such unscientific statements and make up our minds that orthodontia is nine parts scientific and one part mechanical. When we do this we will place our profession where it belongs.

CONCLUSIONS

1. Both dental and medical textbooks concerning the dental arch at birth are at present misleading students and are contrary to careful observations.

2. We have malrelation of the dental arches, malformations, and conditions

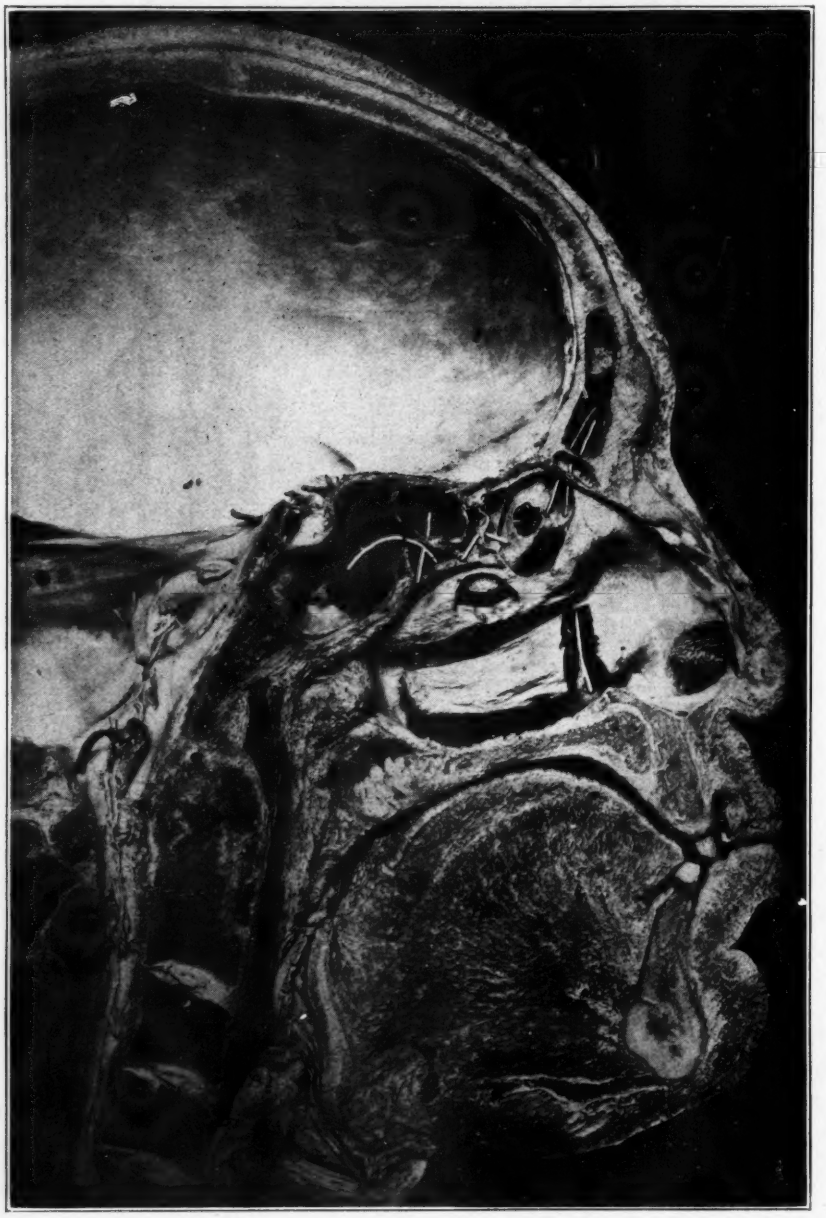

Fig. 26.—Section of frozen skull showing adenoids and tonsils.

to contend with prior to birth, varying in a marked degree. Thus we find malocclusion in the deciduous teeth.

3. A great many early abnormal conditions will, undoubtedly, be found to be the result of mechanical disturbances, the result of amnion pressure.

4. During development the skeleton is markedly influenced by internal secretions, affecting growth or general nutrition of the body, tongue, jaws, and the teeth.

5. In orthodontia we have the question of internal secretions to contend with and a greater cooperation between the orthodontist and the medical profession is necessary if we are to obtain results.

6. Adenoids and tonsils do not cause malocclusion of the teeth, but both are the result, undoubtedly, of the same common etiologic factor.

Therefore, as orthodontists, let us lay aside the idea of our science being nine-tenths mechanical and begin to solve these intricate problems taking place during ontogenetic development. When we do this we will place our specialty among the foremost of sciences.

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DISCUSSION

Dr. W. J. Brady, Kansas City, Missouri.—Mr. President and Gentlemen of the American Society of Orthodontists: It places me at a considerable disadvantage to discuss this paper from the fact that I have never heard or seen anything of it before it was presented to you, and while I must admire the painstaking work of the essayist who has taken such pains to bring this to our attention, I must disagree with him in a number of his findings and as to the material he is working upon. He is away off. It seems very unkind for me to say that, especially to a man who has come so far to give us this contribution in the spirit in which he has given it, and for an outsider like myself who only comes from a city that is within an hour's ride of this city, but that is exactly the way I feel about it.

This question has been before the dental profession, especially the section of orthodontists, ever since I can remember anything whatever about the subject being discussed anywhere, and they all overlook this one vital point in the discussion of the matter; that is, that no matter what the condition is, unless it be such an absolute malformation like

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cleft palate or absence of the lower jaw, or some malformation of that kind that is unmistakable, the bones of the face will not stay in the condition they are at the time of birth longer than a few weeks. Nature has her own plan of bringing those to their full growth, and it is well that it is so because the human being may start out in life with the bones of the face very much misshapen. If we were to examine case after case, we would find that is the rule, not the exception, and they manage to reach a reasonable degree of maturity, a reasonable degree of saneness, through the treatment we advise. Why? Nature has made her plans whereby these seemingly malformed cases may be straightened out, and in this we overlook two important things, that is, the effect of use upon these jaws in their development. Most malformations do not begin to develop until the temporary teeth are in place and there begins to be a considerable usage of these teeth; I do not say all of them, but the majority of them that we meet with in daily practice. They do not begin to develop until there are some teeth to begin operation upon. The bones of the face have their rules of development apart from other bones. Other bones have their rules of development apart from still others. The cranium gives proper development according to the growth of the brain. We used to think that in some way the brain did not develop as it should, and therefore the brain was restricted, but it is the other way. In case there is no brain tissue developed, the cranium does not develop together with it. In the case of the bones of the face, the thing that develops them is their use, and if that use is given as nature intended, the stimulation of pressure upon the bones from the use of the teeth develops them almost to normal.

We get a wrong view of these things at times. We imagine that the general run of the population have malocclusion, but the fact of the matter is that there is a small proportion of the population of our country that have any particular degree of malocclusion. If you go out and begin to go around among the schools of the four classes, among the people where there are different classes, you begin to open your eyes if you are not so prejudiced that you will not see these things. I can see things outside the walls of my office, and I have discovered there is no such number of malocclusions as I had supposed there were. In the reform schools, where we get the product of the dregs of the community, there we supposed we would find every sort of trouble in the way of malocclusion that could be found, and yet, to my great astonishment, when I investigated cases of that kind I found they had the finest kind of dental arches and malocclusion was the great exception. So we do not find cases of malocclusion as frequently as we have been prone to believe, and it is because Nature manages through her processes to bring about normal development of the bones of the face a great deal oftener than we think.

Now, in malocclusion there are two causes that stand out above all others, and they comprise fully ninety per cent of all malocclusions encountered any place, anywhere, and at any time. The first fifty per cent of this ninety is caused by adenoids and bad tonsils. In spite of our friend's belief, it is the other way, but this particular form of malocclusion is not found unless the adenoids are there first. We have been mistaking a symptom for the cause. It is exactly the other way. Malocclusion is not the cause of anything; it is the product of something, and bad tonsils and adenoids are the cause of fully fifty per cent of the cases encountered. The forty per cent more are caused by disuse, meaning a lack of usage of the jaws and associated tissue. We have learned that through the force of circumstances certain people are compelled to use their teeth; that their jaws develop to the full size; that the dental arches assume normal forms; and there is no use for an orthodontist in that country. If you go to the museums and see and examine the skulls from various parts of the world, and notice the character of food on which these people lived, you will find in those that came from the north among the Eskimos, and lived on food uncooked, and chewed it thoroughly, the jaws developed to accommodate the teeth, and malocclusion is comparatively unknown. If you examine the skulls that come from the southwest among the American Indians, you will find they lived on jerked beef and corn and perhaps gnawed bones, and the Indian boys and girls took away these bones from the dogs to get them to gnaw; their jaws were well developed and full size. We find the jaws grow and develop by usage. Usage is an immense factor in the development of the jaws, and it is the thing that brings about the great number of full developments or practically normal developments of the jaws in this country which we do not realize are in existence because we do not see them.

I realize that what I have to say in discussing this paper is rambling and not as carefully prepared as the paper which the gentleman from New York has given us, and yet such

as it is, I want to give it to you and leave with you these thoughts that perhaps this idea of prenatal influence we have been prone to believe in is not exactly the thing after all, because personally I have no faith in it. I have never seen any indication which would lead me to believe that it was responsible for only a few malformations. So far as our every day practice is concerned, we do not see these malocclusions or malformations as frequently as the doctor would have us believe, and I hope Dr. Weinberger will not consider anything I am saying as personal. In short, the doctor has given us an admirable presentation of the forces at work causing malocclusion and malformation, and I admire him for bringing this subject before us, and while I must disagree with him as violently as I do, yet I hope that we will not be carried away with the idea that this belief amounts to any great thing.

The belief that prenatal influence has a most wonderful influence over the growth and development of human beings is as old as time; but that does not mean, however, that it necessarily has any scientific foundation. No belief necessarily has to have a foundation, much less a scientific or sensible foundation. Most of the beliefs we have are due to our ignorance or prejudice rather than to any real knowledge, and because that has been the belief for so many years, is no reason why it has anything back of it. There are many other things that have been believed and are yet believed in spite of the fact they are true. There is not a dentist who has not been asked every year the question of whether loss of the eye teeth will not cause trouble with the eyes and cause blindness, and whether a great many things of a similar character may not occur if such and such is done with certain teeth? The belief has nothing to do with the facts in the case. So the belief that prenatal influence can exert any particular influence over the growth of an individual outside of an unusual case does not necessarily have any foundation.

Dr. B. W. Weinberger.—I appreciate what Dr. Brady has said and the spirit in which he has given it, but I can not agree with his idea of looking at it from his standpoint.

As to his comment on not receiving my paper, thereby preventing him from going over it before the meeting, had I been notified I might have forwarded him a copy. Until I saw the program this morning I was not aware as to who would discuss the paper. I believe it is up to the executive committee to notify an essayist, so that copies might be forwarded.

Had Dr. Brady received a copy, I firmly believe he would not have assumed the attitude he has taken. We have malformation prior to birth, this fact can not be disputed any longer. To say that science does not recognize prenatal influences is assuming too much. The sooner all of us realize this, just that much nearer are we to our goal. How large a percentage of abnormalities we have at that age no one knows. In going through the hospitals in New York, out of hundreds there were not more than a dozen well-defined cases, so that the percentage is small, but we have definite malformations at birth.

There is no question but that prenatal influences are having a peculiar effect and it is being investigated by men connected with diseases of children, infant feeding, and so on. These men have tried to determine why children have to be taken off the breast and put on the bottle. As explained in my paper there are infants who can not nurse from the breast, due to the distal relation of the mandible, so there must be something back of prenatal influences. Then, how about those cases reported with increased growth of the maxilla and mandible, as well as those cited from various investigators showing the effect on the teeth?

THE CONCEALED LABIAL ARCH WIRE WITH SPRING EXTENSIONS*

By Lloyd S. Lourie, D.D.S., Chicago, Ill.

IT was a mistake that my name appeared on the program for a paper, as I had intended to give only a table clinic, allowing the appliance to speak for itself. Yet it does involve important principles in appliance construction, which may be worthy of discussion before the society. I regret that my illustrations are not more comprehensive, due to the fact that they were collected after the printed program was received, and when many of my patients were away on vacations.

For best results mechanically and physiologically, force should be applied to a tooth only in the direction in which it is desirable for it to move. For that reason, appliances should be so constructed as to allow individual tooth

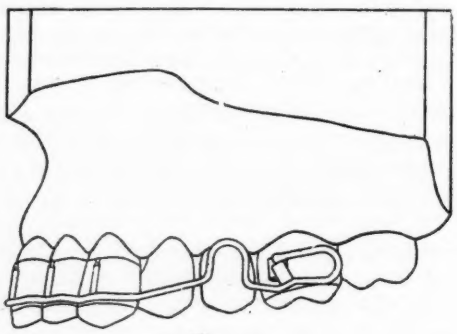

Fig. 1.

movement, without undesirable reaction on adjoining teeth, and with the minimum of change in the reaction on anchor teeth. Angle has emphasized this point, and rightly criticized the use of spring loops, because of constantly changing direction of force. In Dental Cosmos, September, 1916, speaking of vertical loops (Fig. 1) in buccal portions of arches, he says: "My criticism is that instead of the force being delivered evenly to the anchor tooth and *in one direction only,* as is easily possible with the screw, the direction of force is constantly changed, thus mischievously disturbing the function of the cells of the peridental membrane and the alveolar process. And this must be repeated with each change in the form of the loop."

Later he limits this criticism to vertical loops in buccal portion of the arch attempting to whitewash the same objections in horizontal loops in other portions of the arch, which are so extensively used in his pin and tube and ribbon arch appliances (Figs. 2, 3 and 4). However, I submit for your consideration the suggestion that spring loop reaction is much the same whether in vertical or horizontal plane. Also, that the various arch bends and twists by which

*Read before the Seventeenth Annual Meeting of the American Society of Orthodontists, Excelsior Springs, Mo., Sept. 7, 1917.

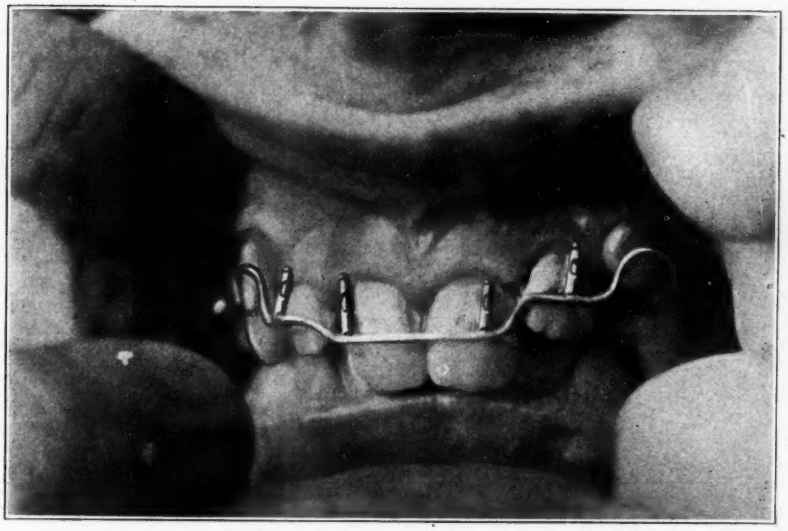

Fig. 2.—Angle's pin and tube appliance. (Ketcham.)

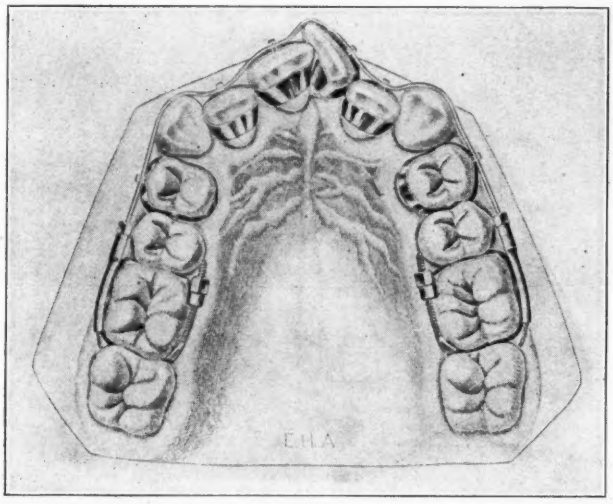

Fig. 3.

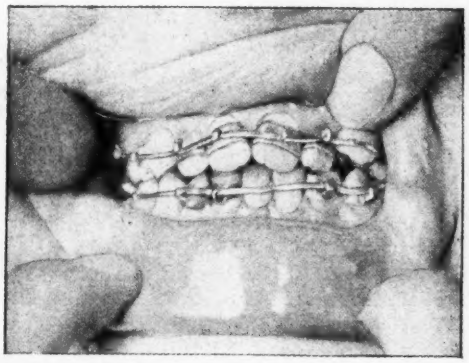

Fig. 4.—Angle's ribbon arch adjusted to the teeth.

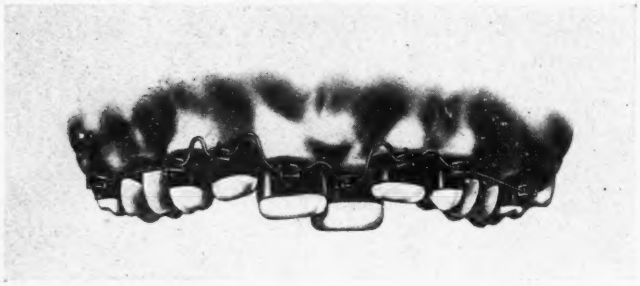

Fig. 5.—Robinson's alignment wire with blocks in seats.

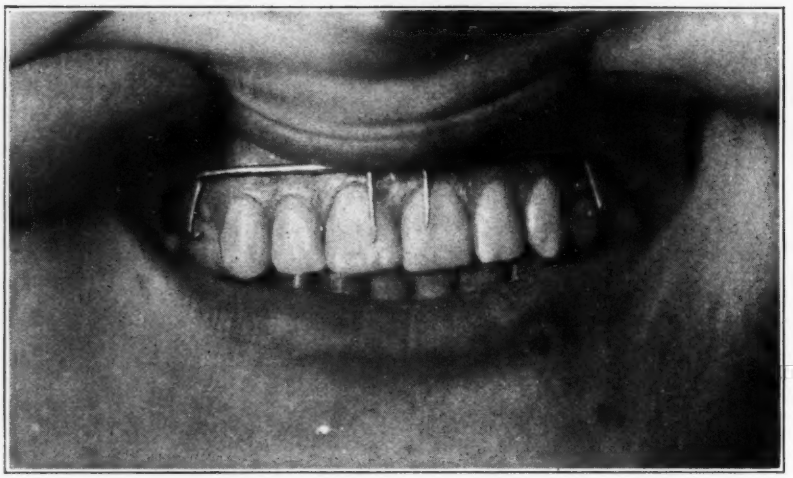

Fig. 6.

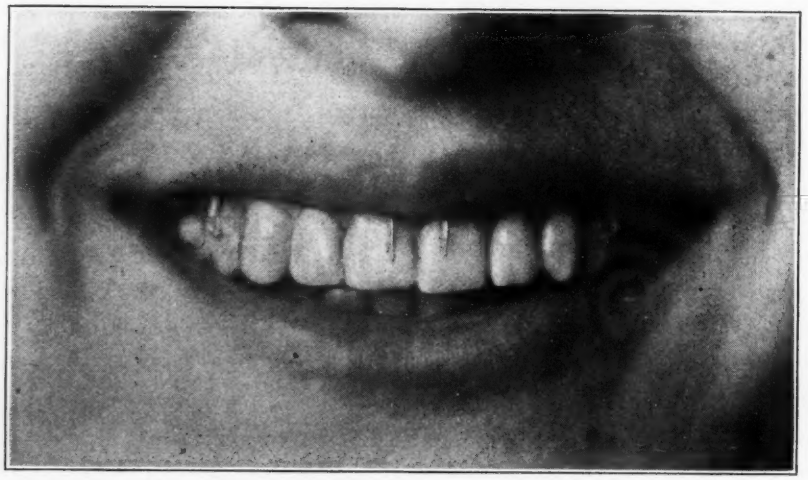

Fig. 7.

force is applied in the above mentioned appliances and the Robinson appliance (Fig. 5), or any other of the same principle of force delivery, are but modified forms of spring loops and subject to the same criticism. In all of them where

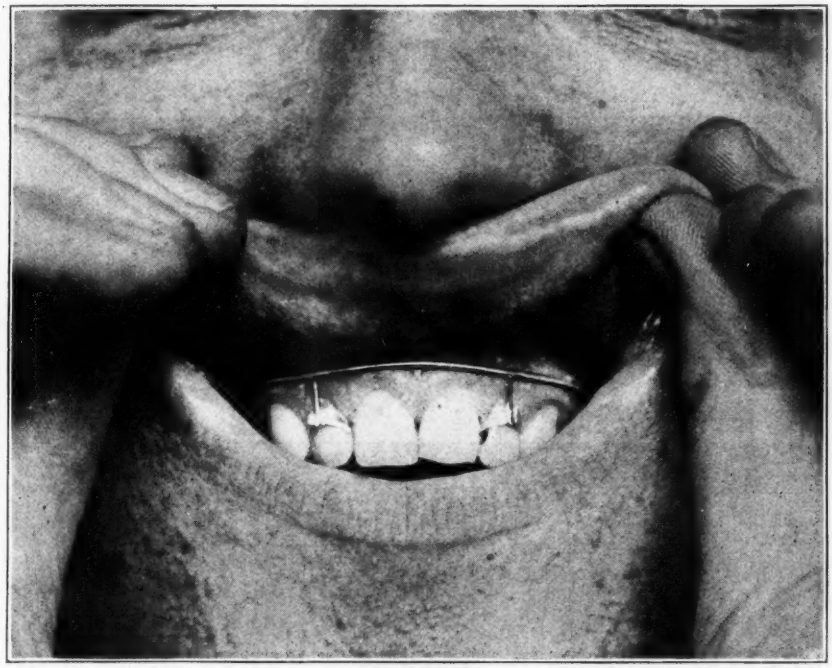

Fig. 8.

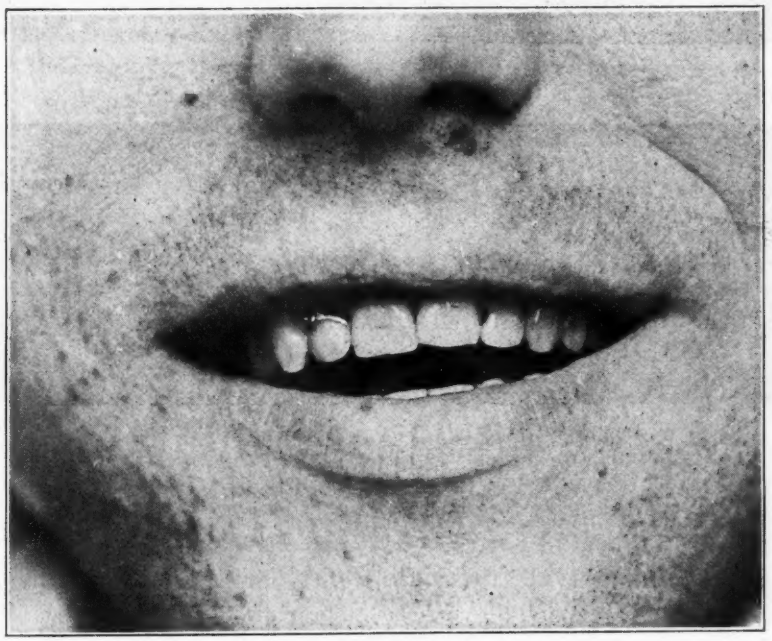

Fig. 9.

several adjoining teeth are being moved, the only possibility of individual movement is in the section of arch between the adjoining teeth. The spring pres-

sure for moving one tooth must react on the adjoining teeth, before it can react on the main anchorage. Sometimes this is desirable, but often a great disadvantage. Furthermore, with all thin or small gauge arches, there is increased danger of injurious changing reaction on the main anchorage by bending of the buccal portions of the arch. This may be controlled by a supplementary lingual arch. In fact, I believe it good practice to use such a lingual arch for

Fig. 10.

Fig. 11.

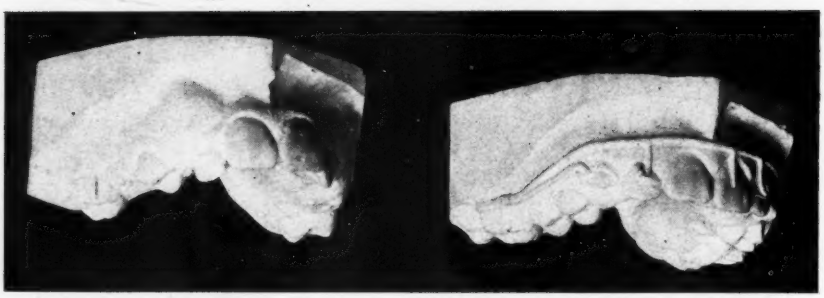

Fig. 12.

increased stability of anchor teeth wherever they are to be subjected to much force.

The appliance that I will describe is not claimed to be of universal application, nor does it "meet every hygienic and physiologic need," but I believe the principle is correct, I have used it successfully in a variety of ways, and I feel that its usefulness can be greatly extended.

The appliance consists of a comparatively rigid base wire (Fig. 6), preferably adjustably attached to anchor teeth, and small spring extensions for

delivering force for individual tooth movement. The form of attachment of base wire to anchor teeth depends upon requirements of the case. The base wire lies beyond the teeth gingivally, but does not touch the soft tissues underlying it, and is usually hidden entirely by the lip (Fig. 7). The springs may be of various forms and sizes (Figs. 10, 11 and 12), the simplest being the straight vertical one (Figs. 6 and 7). This may be used to press against a tooth or to pull on it if attached by ligature. The end of the spring may be a point, knob, eyelet, or incisal hook. The one possessing the most varied possibilities is the recurred vertical spring (Figs. 8 and 9), the recurved end entering a vertical tube on the banded tooth. With this spring, the tooth may be moved in any advisable direction or combination of directions, including root movement and rotation, excepting for extrusion or intrusion (Figs. 10, 11 and 12). These latter movements may be provided for by adding a horizontal section close to the base wire, or by utilizing the spring of the base wire itself, if that would not react unfavorably on the other teeth being moved. The end may be locked in the tube or allowed to move freely if required. The vertical springs should be used wherever possible, for hygienic reasons (allowing use of toothbrush and floss) and particularly in the front of the mouth for esthetic reasons, as they harmonize with the lines of approximal contact of the teeth (Fig. 7); whereas, the horizontal extensions contrast and are more conspicuous.

By using the appliance in combination with a lingual arch, in many cases teeth may be moved as desired without the use of either bands or ligatures. In fact, by applying the same principles, much can be done with the lingual arch alone, the horizontal spring extensions being more adaptable, however.

In closing, let me emphasize that the force for individual tooth movement should be controlled in the individual spring extension, the base wire being used as anchorage for these reactions, and for movement of teeth in groups, and for intentional movements of anchor teeth.

DISCUSSION

Dr. Martin Dewey, Chicago.—In discussing this paper of Dr. Lourie's I can only add my support to what he has said in regard to the use of this appliance, and, to a certain extent, call attention to some things he has mentioned regarding the deficiency of other styles of appliances.

It seems that regulating appliances have passed through evolutionary stages, and while some of the changes made in the construction of appliances have been progressive, other steps have been backward. Any regulating appliance to be successful must possess certain requirements, and I think you will find that this appliance as used by Dr. Lourie possesses more ideal features than any other style of appliance that has been brought out.

One thing which I want to call attention to is the subject of anchorage. If you remember the literature of a few years ago, when the question of bodily tooth movement was extensively advocated, attention was called to the fact that we had to have firm anchorage. The pin and tube appliance and ribbon arch are appliances composed of flexible alignment wires, which control both the anchorage and the moving force. As a result of this you are apt to have more or less trouble with the anchorage. You take a small gauge arch, such as a ribbon arch, bend it around in the various positions it is to occupy when attached to the malposed tooth, and it exerts a force on the anchor teeth that is hard to control, as you have all sorts of reactions that are influenced by each adjustment you make to the malposed teeth. If you attempt to bend the ribbon arch to exert force on one tooth, and have the arch attached to the proximating teeth, you are

bound to have a reaction on the proximating teeth, which shows the individual tooth adjustment is impossible.

Mention has been made of the fact that the lingual arch can be used to increase the anchorage of the molars. In using the concealed labial arch or labial alignment wire which is constructed of rigid wire with spur extensions, to a certain extent you divide the appliance into two parts: your base wire becomes your anchorage and the spur extensions your moving apparatus. Individual tooth movement is controlled by individual springs. If you bend one of these individual springs, whether it is adjusted to a band or in contact with the tooth, you know you have all pressure on that individual tooth. It does not affect the approximate tooth only as the force is reactive to the base wire, and the individual spring extension should be so delicate that it will not disturb the base wire. You will also have very little danger of changing the molars bucco-lingually because of the rigid base wire.

There is not very much more I can say except to call attention to some of the deficiencies in other styles of appliances and to some of the advantages which Dr. Lourie has passed over and has not impressed upon you sufficiently. In any style of appliance that consists of a small gauge wire rigidly attached to the moving teeth, and the appliance is adjusted from lateral to central and over the canine and around the molar, in attempting to change the shape of the alignment wire you get so many reactions on the malposed teeth that you do not know what is happening to the anchorage. These reactions are absolutely impossible for the average man to figure out. When you have the teeth attached rigidly, you can not adjust the appliance on the central incisor without reacting on the lateral. With a spring or a pin that is short, you lose the elasticity of the pin, or the elasticity is interfered with by the stiff alignment wire. As a result of this when you have force exerted on the central it will be reacting on the lateral and vice versa.

From the hygienic standpoint, the advantage of Dr. Lourie's appliance is easily seen. We can use a toothbrush or floss silk successfully. Those of you who have seen some of those "late" appliances in the mouth know that they look like the front window of a hardware store, and they accumulate everything that can be found in the average garbage can. The ribbon arch possesses the same disadvantage as the pin and tube appliance from the standpoint of application, only more so. You have greater trouble in making adjustments because of the impossibility of bending the flat wire with any degree of certainty. Owing to the difference in the thickness of the ribbon arch occluso-gingivally as compared with the thickness bucco-lingually, it is impossible to make a bend occluso-gingivally and have the same degree of spring or action that you would have bucco-lingually.

As regards the action of the loop which has been mentioned, the loop in the wire always changes its shape and always exerts a tipping influence if the appliance is attached rigidly. In those cases in which you use it, if you start to adjust the appliance on a lateral, something always happens to the appliance in the molar region. As you increase your bends or loops bucco-lingually, you increase the complications of the loop bucco-lingually, which is just as troublesome as a loop occluso-gingivally. If the attachments in these appliances were not so rigid, the objection would not be so apparent. If you use a wire ligature in an appliance that has loops in it, you will not get as unsatisfactory results as you would with a rigid attachment because of the movement between the wire ligature and the loop in the appliance.

Let us take the appliance that has been exhibited. Dr. Lourie has called our attention to the fact that the base wire must be placed gingivally, but he did not mention the height at which it should be placed. In this you are governed by the attachments of the lip. Of course, the higher you have it placed, the longer the spring will be. In the molar region the height will have to be governed by the attachment of the anterior portion of the buccinator muscle or the posterior portion of the levator labi menti. As a result of that, the wire must not be so high as to interfere with the attachment of the lip. In some cases where the frenum is low, you can make a bend in that region to avoid interfering with the frenum. If it interferes with the action of the muscles of the lip you will have trouble. With the spurs attached to the lateral incisors, you have the advantage of individual tooth attachment without disturbing the base wire. You do not have that with the pin and tube or ribbon arch or similar style of wire.

Dr. Abell asked Dr. Robinson a question which I think to a certain extent might be

mentioned here, with reference to the expansion of the molars. You take these small gauge wires and as a result of the reaction which you get from the incisors, it is difficult to control molar anchorage. The more attachments you have in the incisor region with a small gauge alignment wire, the less you will know what is happening to the molar. The action of the ribbon arch is unsatisfactory in this respect.

One of the most important things to remember in connection with the application of this appliance is that of esthetics. We find patients will wear any kind of appliance at first, but after a while they begin to object to the appliance on account of its being so conspicuous, and if the appliance is inconspicuous we will have less trouble. A youngster who wears a conspicuous appliance is not only annoyed himself, but he annoys his parents and friends. People get tired of seeing his mouth full of bands and conspicuous material. These spurs or spring extensions are almost invisible and contain such a small amount of material that they can be used to great advantage as retaining appliances as well as regulating appliances. In a great many instances, after a case is treated and the teeth moved, it is hard to devise a retaining appliance that is less conspicuous and has less material than the regulating appliances you have on. That is a great advantage because we know sometimes we are not able to retain patients as soon as we would like. They say, "I am going somewhere; I am leaving for a vacation." The time is short. You can not change the appliance, but if you have one like this on, they can go because your regulating appliance is also a retaining appliance. It saves a great amount of time, and it is a source of great satisfaction in a large orthodontic practice.

Finally, I honestly believe there is no other appliance which possesses so many desirable features, both from a mechanical and esthetic standpoint, as this appliance does. The patient derives great comfort and satisfaction in wearing it, and as compared with some others it will compensate you for the extra technic necessary in constructing it.

Dr. W. H. Ellis, Buffalo.—When Dr. Lourie speaks we always get something good, and today is no exception. His introduction on the subject of dynamics is very clear and the observations correct. In my opinion, however, we still have use for spring loops in many cases. I find them of advantage, particularly in appliances designed for the development of deciduous arches. I agree with the essayist when he says that "spring loop reaction is much the same, whether in vertical or horizontal plane." In principle it is somewhat the same as when applied to round arch wire of the metals as now used in orthodontia.

It seems to me, that the contraindicated and unlooked for reactions can usually be eliminated and the results justify their use. This involves, of course, very careful predetermination of the form and extent of the loop bends, so as to put the force in only the desired direction. The arch wire should be of fine gauge and only a minimum amount of pressure exerted at each change,—only an amount that will stimulate a normal development.

Dr. Lourie has, indeed, given us a valuable appliance, particularly so for esthetic reasons and its efficiency. It is an appliance we shall all gladly make much use of.

The thought comes to me that the position of the arch wire farther up under the lip will be likely to cause less distortion of the lip than the usual position at the gingivæ.

This appliance shows us that we are rapidly approaching the ideal technic, one that is esthetic, inconspicuous, and simple. This appliance exerts gentle force only where indicated, and, at the same time, allows for that individual tooth movement so necessary physiologically.

Dr. Calvin S. Case, Chicago.—One of the most encouraging things that comes to my mind in regard to the presentation of these two papers that we have listened to this morning is the fact that we are not confining ourselves to any one single method; and that we are now willing to accept other methods. Another thing is it requires the orthodontist to do a great deal of the technical work himself, which enables him to apply the proper forces and make changes in variation that are especially adapted to the particular cases in hand.

I have been somewhat acquainted with Dr. Robinson's method for some time, and have thought a great deal of it. I think there is a great deal in it that is valuable, but, of course, it will not do for all cases. I am now very much pleased to hear Dr. Lourie's paper and to learn more of that which he has from time to time given me ideas regarding. I consider it a very valuable method, and one that will prove to be more and more valuable in practice. It is certainly very desirable to have our appliances as inconspicuous as

possible, and if the forces can be applied by this method safely and according to mechanical principle and physiologic needs, it is certainly exceedingly valuable. I do not know enough about it to really talk in regard to it, but I am interested to know more, and will endeavor to study the forces that he expects to obtain from it.

Dr. G. W. Grieve, Toronto.—I would like to suggest that Dr. Lourie, when he closes the discussion, give us a little more idea of the technic of the composition of this labial and lingual arch, and give us a clearer presentation, if possible, on the use of his positions of lingual wire and the extension.

I certainly have appreciated very much the presentation of this subject by Dr. Lourie. I have had the pleasure of getting good results from the use of the lingual arch as used by Dr. Lourie, not fixed, as Dr. Lourie uses it a great deal, but as a removable appliance.

I am happy to have heard this paper.

Dr. R. Ottolengui, New York City.—I want to say a word or two in regard to this paper. We have had presented to us in an altogether too abbreviated manner a method which appears to be one of the most important that we can use. Dr. Lourie and Dr. Dewey in presenting to us the advantages of this appliance have used the same slides repeatedly and have expressed these advantages most accurately, but we find the labial surfaces of the anterior teeth are all in normal alignment. This is not a malocclusal position. There are no malpositions to those teeth. Frequently patients come to us with nearly all the teeth in torsiversion.

It seems to me, we are not going to find it so easy to get away from the use of bands if we use rigid base wire above the arch and depend upon a pin to rest against the slanting surfaces of the teeth. I do not know that I make myself perfectly clear to you, but I have seen this appliance before, and you will observe the only case that was shown concerned the anterior teeth wherein the malposed contained bands. A question arose in my mind in the actual treatment. I do see how, as a retainer we have a very esthetic and inconspicuous appliance because of the absence of bands. I do not think the essayist has made it clear to us how to get rid of bands where the teeth are in malposition, and especially in torsiversion. That is more, however, in the form of a question rather than a criticism, because I fully appreciate Dr. Lourie's great ability.

Dr. L. S. Lourie.—Dr. Grieve wants a fuller explanation of what I have said, and so does Dr. Ottolengui. Much of what I have said, in this short paper, has been presented by Dr. Dewey in the form of an article. I have not felt that I had time to prepare a paper that would cover the matter in such great detail as I would like to present it. However, I am willing to go into the matter in greater detail. if the society so desires, and answer other points which were brought up.

Dr. Dewey mentioned the advantage of looping the base wire on account of the frenum. I want to suggest that while that is an advantage, if there is going to be any particular use of the base wire for exerting changes on the anchor teeth, there will be the same objections previously made to loops. So I believe the fewer bends and loops you have in the base wire, the better. If it is a patient who has a short upper lip, such a loop might be used in spite of the above objection to it. No appliance fills every need. When we select what we think is best for a case in hand, it is a compromise. We select an appliance that has the greatest advantages and fewest disadvantages.

Dr. Ellis says he still has use for spring loops, and I have no doubt we will use them at times, recognizing their limitations, however.

I indorse the opening remarks of Dr. Case, it is a good sign that we are all willing to accept other men's ideas, and not say that whatever ideas we have can not be improved upon as some have advised.

Dr. Ottolengui.—Can you handle teeth in torsiversion without bands?

Dr. Lourie.—I can correct teeth in torsiversion, in a great many cases without bands. It depends to some extent upon the shape of the teeth. Take a tooth that has broad flat surfaces, where I can get the labial extension far enough off the center of the tooth to get leverage and have a fulcrum formed by the lingual appliance, I can correct it.

Dr. Ottolengui.—In conjunction with the lingual arch?

Dr. Lourie.—Yes.

Dr. Ottolengui.—Is it (the lingual arch) necessary? If you bring the spring extension to the correct point labially as the pressure continues, you fit the tooth; you rotate it to a certain extent.

Dr. Lourie.—A certain amount of rotation may be accomplished with the labial spring alone. In this paper, there is no description of the lingual and labial arch combination as that has been previously covered in articles by Dr. Dewey. I was presenting a new thing, the recurved labial spring extension with band and tube which may be used for various tooth movements instead of the combination of pressure lingually and labially. As I have said, my first choice is a lingual arch; my second choice is a combination of the lingual and labial arches without bands, and my third choice is something of this sort, if I wish to get quicker results with less frequent appointments, or have more certain control over my work.

In a particular case shown here, I started the treatment with the lingual arch but discontinued it, the child having considerable defect in speech, and the mother was inclined to believe, as most people would naturally, that the lingual bar had something to do with it or prevented its correction. My experience with lingual bars is, that if they are placed right and allowed to lie in the rugæ of the mouth, they do not interfere with speech. I would have continued with the lingual appliance, but I decided I would not put myself in a position of being criticized for in any way preventing that child from developing correct enunciation. So I adopted this labial appliance. I could have accomplished rotation of the laterals, carrying them out to normal position, with root movement by a combination of labial and lingual arches without the use of any bands. I am presenting this labial arch with recurved spring extensions because I believe it will require less skill and careful adjustment to accomplish results than the use of the combination of arches. There is nothing patented about it, and you have perfect liberty to modify and amplify it to suit your individual needs.

Dr. Case.—Will you explain the intruding and extruding forces, acting on a portion of a tooth?

Dr. Lourie.—There is one illustration which shows a cuspid being extruded (see Fig. 12).

Dr. Case.—There is a band with a horizontal spring. You must have force directing in that way to correct the alignment of the teeth.

Dr. Lourie.—Yes.

Dr. Case.—I wondered how you did it.

Dr. Lourie.—You can use the labial arch with the extension; you can put horizontal extension to the vertical extension and get a spring that is up and down.

Dr. Case.—By having the loop in the small section attached to the base wire?

Dr. Lourie.—Not a loop, a right-angled bend. You have it attached here (indicating) and go over there from the base wire and bend down. That gives vertical action without direct action of the arch, without transmitting force to the adjoining tooth. Dr. Ellis has suggested that arches placed as these are placed would interfere less with the lip. I have tested this out by clinical experience and find patients do not object to it. An arch placed across the teeth is where the tip of the lip is moving and it is in the way. Some patients who have changed from the old one say, "I don't care how long I have to wear the new one, it does not bother my lip." In cases where there was a deficiency in the function of the upper lip, I have taken off the labial arch to test retention and mothers have said, "I wish you would put that back, for the lip was held down better with it on." If the arch is across the teeth, in smiling, it is uncovered and the lip rests above it. When the arch is above the teeth the lip is pressing over it all the time and more easily develops normal function.

Dr. Federspiel.—Is there any irritation of the epithelium of the lip?

Dr. Lourie.—I have not had any. That is another reason for not making the base wire too small. If you make it too small, the lip falls in over it and irritation results. You must be careful how it is adjusted. If it is allowed to extend out from the gum at any particular place, you are bound to have lip irritation. As I have mentioned, this must be adjusted so that it does not come in contact with the soft tissues underlying, otherwise you occasionally have some pressure on the soft tissues, and you must adjust it to allow for changes due to erupting teeth, particularly the cuspids. If you are not particularly watchful, the gum will press up against the base wire and you will have trouble.

Dr. Ottolengui.—Is the appliance removable?

Dr. Lourie.—Yes. The labial base wire is removable. The attachment is a horizontal tube with the nut in order to adjust it mesio-distally. It is possible to use plain wire, bend it at right angles upward and forward and get more or less mesio-distal adjustment in the

buccal portion of the arch, but you have to make compensating bends, and each bend affects the fit of the labial portion of the arch.

Dr. Grieve.—Does the horizontal tube have a nut at the distal, as well as at the mesial end?

Dr. Lourie.—No, I use a horizontal tube with a nut at the mesial end, and a silk ligature tied in front of the nut and distal to the tube. My reason for that is as follows: I tell my patients, with the utmost confidence that they do not need to have sore teeth; that soreness is an indication that I have not my appliance under control. If I can not get the appliance under control in the first adjustment, I can generally do so in the second. The teeth may be a little sore because they have not become accustomed to the pressure, and I would rather make use of an appliance that can be removed by the patient, if necessary, than have the patient spend a night with sore teeth. If one of these extensions should get broken off or bent at any place, there might be undesirable pressure upon some of the other teeth. So I tell them that if the appliance is bent or injured in any way, I would rather have them cut the silk ligatures which I tie in front of the nut and back over the tube. As Dr. Dewey mentioned, the use of the appliance may be continued without change for retention. However, to eliminate bands, it is necessary to use a lingual arch for a fulcrum and the labial arch with extensions to control the rotation and root movement. This may not be effective in every case, particularly if complicated by intrusion or extrusion.

Retention can be developed from a moving appliance, by removing the band and the recurved portion of the spring, which leaves a simple vertical spring extension. This may be bent, so that the end of the spring comes in contact with the most desirable point on the tooth for control. If this is not effective, all that is necessary is to replace the spring extension and band, as no change has been made in the remainder of the appliance.

After the appliance has been worn continuously for some months as a retainer, small hooks are added so that rubber bands can be used instead of silk ligatures for holding it in place. The patient may then take it out for short periods. Young ladies appreciate this privilege for special occasions. That is the first step. Then, when I think the teeth are firm enough, the labial arch may be left out during the day, provided that when it is out it is placed on a form such as I have illustrated (*Dental Items of Interest*, January, 1916). That is done for two purposes, one of which is to prevent the extensions from being bent while the appliance is out of the mouth, and another one is that the patient can know if it has been bent while getting it out or putting it in. It is brought in for readjustment if necessary. It is not a bad idea to have two of these forms, one in the office so that it would be less work to reconstruct the appliance in case the appliance and one form should be lost.

Dr. Federspiel.—What prevents the molars from tipping?

Dr. Lourie.—Use the same precautions to prevent straining the anchorage in this appliance as in any other. You can reinforce the molars by attaching additional teeth, as Dr. Case did in his appliance. I reinforce the molar anchorage in a great many cases with lingual arches which may have no other use, though they may be used later in combination for retention. The lingual arch is extended forward, and fastened to the bicuspids with ligatures or bands with lingual extensions to prevent tipping of the lingual arch. The lingual arch is the reinforcing lever and counteracts the tipping tendency of the labial arch.

Dr. Ottolengui.—I would like to ask Dr. Lourie how he prevents extensions from slipping up.

Dr. Lourie.—I mentioned that in my original presentation. (Hooks over incisal edges if bands and tubes are not used.)

A Member.—Do you use this appliance on all patients in temporary dentures?

Dr. Lourie.—I do not believe in using such an extensive appliance for temporary dentures as a great many men advise, because by the time a deciduous denture is expanded, frequently the teeth and expansion will be lost any way. It is just as important to keep a deciduous denture in good solid condition so that the child can masticate thoroughly with it, as it is to attempt to get some effect upon the permanent denture by mechanically expanding the deciduous one.

A Member.—What about the other extreme?

Dr. Lourie.—There are many cases in which all that is necessary to do is to expand enough to allow the incoming incisors to take their positions in the arch. Naturally widen-

ing of the rest of it will follow. My plan is to assist in developing cases where it is necessary.

A Member.—What is the extreme age of patients on whom you use this appliance?

Dr. Lourie.—It depends upon what you are going to undertake. The limitations of age would apply equally well to any other appliance.

It has not been my desire to give a talk on the use of my lingual arch and wire stretchers because I feel it is something I developed especially; and while I am getting results I can not explain the details and dangers of it fully enough to warrant you in trying to extend its use. I probably had better not tackle that phase of the subject, but after I came to use the lingual arch and enlarged it with my wire stretchers, I found that was the most direct and simplest force I could use. If the pinch is made straight, it corresponds to a jackscrew, and you have the lingual arch lengthened in the direction of the portion pinched. The arch can be lengthened mesio-distally by pinching the lateral portions and can be widened buccally by pinching the incisor portion, and in many cases that is all that is necessary. There is a disadvantage, in that the action is limited, but I believe that usually I can get movement as rapidly as is advisable. I also use a lingual arch with spring extensions. The same thing applies as to the labial arch, the fewer bends and kinks you put in, the better, because of the reaction. I prefer a lingual arch that does not come in contact with the teeth or soft tissues, with spring extensions for getting movement of the teeth, later, if necessary, using a combination of lingual and labial arches for finer adjustment.

A Member.—In using a lingual arch do you use a round or oval tube?

Dr. Lourie.—The form of attachment depends on the case.

A Member.—Do you mind saying a few words about the materials?

Dr. Lourie.—I have not found anything that compares with iridio-platinum for use with wire-stretching pliers. It has a compressibility and ductility together with rigidity that I have not found in any other material. The labial base wires I have used mostly, have been 17-gauge platinum gold expansion arches, with 22-gauge platinum gold spring extension. With this I have had more or less spring through the action of the base wire itself, because the 22-gauge spring was really so stiff, comparatively, that it reacted upon the base wire. But more recently I have used 19-gauge iridio-platinum base wires and 24-gauge platinum gold for these extensions. Where it is a plain spring and not recurving into the tube, I have tapered down the 24-gauge spring until the lower half of it was not more than 26-gauge. That is as thin as I have used it. You can use 26-gauge for recurved extensions. I have not used it because I could get only the larger tubes.

Platinum is not springy enough for the extensions. The particular grade of metal you use is important. The point is that the base wire should be comparatively rigid, while you want as great a range of spring in these little extensions as you can possibly get. If any one can tell me of something that has more spring to it, I would be glad to hear of it.

AN EXPERIMENTAL STUDY OF ROOT-FILLED TEETH: PRELIMINARY REPORT

By M. B. Cohen, M.D., West Salem, Ohio

SINCE the epochal work of Billings and Rosenow, many diseased conditions have been traced to focal infections in the oral cavity; clinicians have learned that the mouth contains something besides the tongue and are intelligently examining the teeth and the tonsils. Until recently medical students and internes were not taught to notice the condition of the gums and teeth or to associate disease in these organs with the patient's bodily ills. They were allowed to gain the impression that these organs served a mechanical purpose only, and that their pathology was of importance only in proportion to the disturbance of local function which it caused. Lately many observers have commented on the remarkable clinical results in arthritis, neuritis, myositis, and other obscure symptom-complexes following proper dental procedures.

Because it is relatively easy to diagnose a case of pyorrhea and to get the cooperation of the patient in carrying out proper methods of treatment, the relation of this disease to many systemic conditions has been established clinically.

There is another type of tooth disease, however, which, while not so spectacular in its local end results, is probably as dangerous to the health of the patient, namely, the periapical infection. Unless accompanied by a fistula, this painless condition was, until recently, undiagnosed or disregarded, as it was a common practice to regard a painless tooth as a healthy one. The routine use of the x-ray has made the diagnosis relatively easy and has instituted a study of this type of infection by many workers. It has been claimed to be possible to completely sterilize these areas through the root canals, to completely fill the latter, and to eradicate the disease; and roentgenograms have been produced which apparently show a growth of new bone around the tooth apex.

While such results may be possible in the hands of an expert like Callahan, of Cincinnati, it is useless to expect the rank and file of dentistry to do this work, as it requires great patience, accuracy, absolute asepsis, and bacteriologic control of each stage of the operation.

That root canal filling in average hands does not eradicate the disease is shown by the following study of six cases of polyarthritis.

Sixty-two cultures were made from "locked areas" beyond the apices of eighteen teeth that had been root filled from six months to twenty years previously by sixteen different dentists, some of whom are supposed to be authorities in their profession. The following two methods for obtaining cultures were used: If the culture was made for research purposes only, the gum and alveolar process were isolated with cotton rolls like those used routinely in dentistry, dried, and painted with full strength tincture of iodine. A dental hypodermic syringe, which had been previously boiled and allowed to cool, was fitted with a needle, sterilized in the same way and finally passed through a Bunsen flame. A puncture was then made through the gum and alveolar process down to the root

tip, and an attempt was made to aspirate. The aspirated material, whether visible or not, was transferred to suitable culture media and taken to the laboratory for study. Care was taken to culture only those teeth which had no pyorrhea pockets surrounding them. If the tooth was to be extracted, an area for two inches around was isolated with cotton rolls and painted with iodine. The region was then infiltrated with novocaine solution which had been boiled and proved to be sterile by bacteriologic checks. The electrocautery was next used around the neck of the tooth and it was extracted through this sterile field with a forceps which had been heated in the flame. The apex was then clipped off into the culture medium by means of a heavy rongeur forceps which had also been flamed.

Growth was obtained without exception from each of the sixty-two cultures on some one of the media used. The organisms usually isolated were those found normally in the mouth. The streptococcus viridans was the predominating one; it occurred in sixty cultures. The staphylococcus family was represented in sixteen, always in combination with the streptococcus, while the colon bacillus was isolated in pure culture once. One culture yielded bacillus acidophilis.

It was not possible to obtain cultures from normal teeth by extraction so that control of the second cultural method described above could not be obtained. The area beyond the apex of one normal tooth was aspirated and cultured for control purposes. This did not yield a growth.

If present day dental technic in average hands does not eradicate this type of mouth infection, it is evident that dead teeth in a patient's mouth are a source of danger. Unless an expert root canal operator is at hand, it is good practice to have such teeth removed. To obtain the best results there must be complete cooperation between the physician and the general dental practitioner that they may decide which teeth should be preserved and which teeth must be removed.

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EDITORIALS

Appliances for Physiologic Tooth Movement

DURING the last two or three years several types of orthodontic appliances have been placed upon the market and widely advertised. One of the principal features recommending the appliance has been its ability to produce physiologic tooth movement. The term "physiologic tooth movement" has been used by the manufacturers as a smooth-sounding advertising phrase which has led the public to use certain styles of appliances without stopping to consider what physiologic tooth movement really is. In fact, we find very little in orthodontic literature that explains what physiologic tooth movement consists of. In a description of a number of regulating appliances we also fail to find a positive statement as to why this or that particular appliance is capable of producing physiologic tooth movement to a greater extent than some other appliance. In fact, before we can be certain that any appliance produces a physiologic tooth

movement, we must have some idea as to what constitutes such a movement.

Without being particular in regard to what physiologic tooth movement means, we might say that it consists in the movement of the tooth according to natural or physiologic lines. In the development of the dental arch the physiologic tooth movement is the movement of the teeth during the process of eruption. It might also be said that the tipping or moving of teeth as the result of extraction destroying the proximal contact is to a certain extent a physiologic tooth movement produced by a change of conditions. However, we believe we can safely say that the eruption of a tooth is the result of physiologic development and constitutes in reality a physiologic tooth movement. In that case we have a normal action of all the tissues surrounding the tooth, which is physiologic.

One of the things that we notice during the eruption of the average tooth is that it takes its position in the dental arch without any pain or inconvenience to the individual. In fact, the eruption of teeth that is accomplished by pain is not a physiologic tooth eruption, but one associated with pathologic conditions. Therefore, the first requirement of a physiologic tooth movement is the absence of pain. When we place this as one of the requirements of physiologic tooth movement, we find that a large number of regulating appliances fail in this respect immediately. In fact, the majority of orthodontic practitioners expect to have the patient experience a certain amount of pain during the early treatment of the case and some of them have more or less pain during the entire operation. A great many men are willing to admit to their patients that tooth movement or regulation is accomplished by more or less inconvenience and pain during the entire operation and especially at the first adjustment of the appliance. Now, if a regulating appliance is to produce physiologic tooth movement, it must produce that movement without pain. There are very few appliances on the market that fulfill those requirements, and some of the most advertised physiologic tooth "movers" produce more pain than any other style of appliance. We are willing to admit that sometimes it is difficult to adjust a regulating appliance the first time without making the teeth sore, but if the teeth are sore, it is the fault of the technic, and not the fault of the appliance. In other words, with the properly constructed appliance and with the proper technic, there should be no pain at any time during the correction of a case of malocclusion, and certainly there must be no pain with the appliance moving the teeth physiologically.

In considering the question of physiologic tooth movement, we must also consider the manner in which teeth move during the process of eruption and the condition under which the dental apparatus works. If we study the eruption or the development of the dental apparatus, we find that all the teeth do not make their appearance at the same time, and all of the teeth do not travel in the same direction during the time they are taking their place in the dental arch. They are free to assume positions under the forces of occlusion and take those positions by some of them traveling in one direction and some in another. Nearly every erupting tooth during its process of eruption travels in two directions or more. Of course, it always travels occlusally, but it may also travel buccally or lingually, or mesially or distally during the time it takes its position

in the dental arch. In other words, an erupting tooth does not travel in a positive and direct line, the crown and apex do not move an equal distance or along lines parallel with each other. An erupting tooth does not travel bodily with the crown and the root moving in parallel lines. Very often the crown travels on more or less in the arc of a circle as compared with the apex of the root. If a tooth is naturally inclined to travel in the arc of a circle during the process of eruption, does it not necessarily follow that in producing physiologic tooth movement the tooth must be left free to respond to the forces of occlusion which sometimes will make the crown and the root travel in more or less of an arc of a circle? It therefore follows, that regulating appliances which are supposed to produce physiologic tooth movement will be more satisfactory as they allow the tooth to assume its position under the natural forces of occlusion. Very few teeth require movement in a bodily manner, which means that the crown and the apex travel in parallel lines to each other.

It must also be remembered that in certain types of malocclusion where the teeth have assumed extreme positions it will be necessary by mechanical stimulation to produce a tooth movement which, so far as direction is concerned, does not approach anything we find during the normal process of eruption and development of the denture. However, when it is necessary to produce those extreme tooth movements, the mechanical force applied to the tooth must be of such a nature and of such a character as to produce those extreme movements according to physiologic principles as mentioned before; namely, without the production of pain. If there is any pain during the movement of the tooth, it is an indication that the tooth is not moving physiologically. In order to have a physiologic tooth movement, we do not believe it is possible to move a tooth with a mechanical appliance very much more rapidly than it would move during the natural process of eruption. In extreme cases of malocclusion it necessarily follows that a considerable length of time will be consumed in producing physiologic tooth movement, and the production of a normal occlusion. However, with some appliances that are on the market, the designers advocate a rapid tooth movement, claiming that their appliance is so constructed that a physiologic tooth movement and a correction of the most extreme types of malocclusion can be accomplished in five months. Those who have had any experience with the correction of a large number of malocclusions and who have been observing enough to consider the detriment of rapid tooth movement can only realize the extreme amount of harm that is going to be done by men of small experience trying to follow the advice of appliance designers and manufacturers who advocate a rapid tooth movement and claim that a rapid tooth movement is physiologic.

As a caution to those who are anxious of obtaining the best results and doing the greatest good to their patients we can only say that if there is a physiologic tooth movement they must have a correction of the malocclusion without pain. If the teeth are sore, it matters not what appliance is being used, a physiologic tooth movement is not being produced, and something should be done to modify the appliance so that the soreness will disappear from the teeth. Just exactly what change occurs in the tissues during tooth movement is interesting

from a histologic and scientific standpoint; but from a practical standpoint, we have a positive indication when things are going on correctly and that indication is the absence of pain. Absence of pain is the strongest indication that we have physiologic tooth movement and should be taken as a guide in the treatment of all cases.

Orthodontics and the National Dental Association

EVERYONE familiar with the growth and reorganization of the National Dental Association and with the progress made by orthodontics as a specialty, will realize that the science of orthodontics has not been given the recognition by the National Dental Association to which it is entitled. A glance over the programs of the association for the last few years will convince one that orthodontics has been given a very small place. No doubt the reason for this is that the officers of the National Dental Association have realized that orthodontics is a specialty and has a society of its own which holds meetings and is attended by men who are interested in orthodontics, and orthodontics alone. As a result of this, orthodontics has been kept in a section with other branches and has been given but little recognition. This arrangement has existed because comparatively few men who have attended the National Dental Association in years past have been interested in orthodontics.

With the reorganization of the National Dental Association came the tendency for different sections to hold separate meetings. We believe that at the present time there are enough men interested in orthodontics who attend the National Dental Association each year to make the organization of an Orthodontic Section advisable. At the meeting in New York City there were several branches of dentistry that had separate sections, and we believe they were entitled to representation in the House of Delegates because of being so organized. These sections had their own officers and their own meetings, and we believe they were more profitable to the men attending them than if they had been kept a part of some other section.

We do not believe that the organization of an Orthodontic Section in the National Dental Association would in any way detract from the attendance of the American Society of Orthodontists, nor do we believe that it would in any way conflict. While a great many men who are members of the American Society of Orthodontists always attend the National Dental Association, there are also many men engaged in the practice of orthodontia who attend the National Dental Association, but do not attend the American Society of Orthodontists. There are various reasons for this, which need not be mentioned here. These reasons are such that the organization of an orthodontic section in the National Dental Association would tend to advance orthodontics as a science and in no way be detrimental to the orthodontic societies already organized. In going over the past program of the National Dental Association, while in some instances we find that men who have read papers before the orthodontic branch of this association have also read papers before the American Society of Ortho-

dontists, we also observe that many men who have read orthodontic papers before the National Dental Association have never read a paper before the American Society of Orthodontists, and do not even possess membership in that society.

The organization of a special section entitles that section to representation in the House of Delegates, and the orthodontic profession would, no doubt, have a better standing were it represented by a delegate the same as the Crown and Bridge Section, the Prophylactic Section, the Prosthetic Section, the Section of Anesthetists, and others.

Unless someone can show us that there are not enough orthodontists in the National Dental Association to be entitled to a section governed by its own officers, we believe that something should be done towards the organization of such a section, and we should be glad to use our influence in advocating and perfecting it.

Gritting the Teeth as a Sign of Adenoids

BENJAMINS states that in his experience with 250 cases of adenoids in India and 526 at Utrecht, as also in the experiences of others, comprising a total of 1,544 adenoid cases, a tendency to grit the teeth was manifest in from 25 to over 40 per cent, an average of 34.1 per cent. In his own experience the average was 37.2 and 34.6 per cent. In his 776 cases there was snoring in over 60 per cent; enuresis in 29 per cent; aprosexia in 34.6 per cent, and disturbances in hearing in 42.7 per cent. In 153 operative cases of adenoids, the gritting of the teeth stopped after the removal of the adenoids, and in fourteen it became much less, but it persisted unmodified in fourteen. Examination of 1,654 school children showed gritting of the teeth in 13.6 per cent. Benjamins is confident that the majority of the teeth gritters will be found to have adenoids. In a series of 115 teeth gritters examined for affections other than adenoids, all but two were found to have adenoids. In 10 of the children the teeth gritting was the only anomaly to attract attention, but a large adenoid was discovered in four.—*C. E. Benjamins, in Nederl. Tijdschr. v. Geneesk.*

Inducing a Child to Open Its Mouth

THE rough, brutal and often unsuccessful methods of inducing a terrified child to open its clenched jaws, for intubation, inspection of fauces, or other purposes, would never be inflicted if the simple, painless and always successful method followed for years in Dr. Chevalier Jackson's clinic were known. A seven-inch bent probe is introduced at a gap between or posterior to the teeth and pushed backward until the distal end of the probe reaches down back of the tongue near the epiglottis. This causes the jaws and mouth at once to open. A bite-block or gag is then inserted.—*The Laryngoscope.*

Our Former Teachers in Germany

MANY medical men in this country have visited Germany for the purpose of continuing their studies. The laboratories and clinics of German universities were quite familiar to American medical men. We know the Anglo-American Societies at Berlin and Vienna and have spent many pleasant evenings at them. There we met many of our colleagues from this side and were introduced to leading German professors who talked to us and considerately offered to form classes in the various medical specialties if so many would attend at so many marks each. We learned much at some of these special clinics and lectures, and our professors were able to convert many dollars into marks. The relations between teacher and students were pleasant and for the most part profitable to both. We learned to admire many of these great teachers and possibly to love a few of them. When the war began our old teachers assumed that their old students would be pro-German. Indeed, they could conceive of nothing else. Probably no one in this country, not of German birth or descent understood the German mind and its attitude toward science and truth better than those of us who had studied in German universities. To us the German professor revealed himself better and more fully than anyone else could have done. Every lecture and demonstration was an exhibition of his psychology and in this there were many things which no truth-respecting individual could admire. He was generally a learned man in a narrow way, but too often his learning was greatly overshadowed by his arrogance. To him science was "Die deutsche Wissenschaft" and he found frequent opportunity to extol it. He seldom referred to the researches of the men of other nations, and, when he did so, he most authoritatively criticized, minimized, or misstated the facts.

In a course of lectures on the development of abdominal surgery I heard one of the most eminent of German professors say that Bilroth was the first to do an ovariotomy. As I listened I thought of the shades of Ephraim McDowell and his immediate American and English successors, and I wondered whether ignorance or arrogance was the basis of the false statement, and I pitied my German coauditors who evidently accepted it as truth. In this instance I did dare to remonstrate with the learned man at the close of his lecture, but the interview still left me undecided between his ignorance and arrogance. A course of lectures in the history of our knowledge of digestion contained no reference to the work of our Beaumont and Dunglison, although it is true that at the very time that Beaumont was making his classical studies on Alexis St. Martin, the professor of physiology in the University of Berlin was teaching that the stomach is simply a storage and not a digestive organ. I have searched the voluminous German literature on toxins and antitoxins without finding mention of the fundamental researches of Mitchell and Reichert at the University of Pennsylvania or that of Sewall at the University of Michigan. On the other hand, Calmette and other French immunologists, on visiting Ann Arbor, have first of all wished to see the place where Sewall first immunized pigeons to snake venom. The German professor begins the history of tuberculosis with the discovery of the bacillus by Koch, and one would in no way detract from the honor due to the untiring zeal

of this great man; but it is a fact that at least a decade before Koch began his work on tuberculosis, Villemin had demonstrated the presence of a virus in the tissue and certain excretions of tuberculous animals, including man. Indeed, he went much further than this and demonstrated the unity of tuberculous infections, a fact up to that time most vigorously denied by Virchow and other German teachers.

We know how the German mind has misunderstood and misinterpreted the teachings of Darwin. In the "survival of the fittest," he has decided that he is the only one "fit." "In the struggle for existence," he has shown himself capable of using the most brutal weapons and to resort to the prostitution of science to the accomplishment of his personal and national desires. His arrogance, so plainly in evidence in his classrooms years ago, has grown into a megalomania which has engulfed the world in a cataclysm and threatens to overthrow the pillars of civilization. The German mind is still in an infantile state, and science in German hands is as dangerous as explosives in a playroom.

American scientists who have studied at German universities are not as a rule pro-German. Individually we respected many of our teachers, but we were not blind to their defects. Because we did not leave the table in rudeness, they assumed that we enjoyed the food they supplied, and we did. There was some real sustenance in the broth and a few plums in the pudding, enough to make it worth while, since we already had the fundamentals of science and were able for the most part at least to distinguish between the real and the false. In short, our German professors at that time gave us both instruction and amusement. We were not idiots, blind, or deaf, but we did not fully appreciate the pathologic significance of that well-nigh universal German attribute of arrogance and self-conceit. Even at that time it occasionally became boresome and even disgusting, but we did not fully realize its malignant capabilities. It has grown into a great tumor and must be excised if it takes the rest of the world and all time to do it.

Even the tyro in science knows that most of its great discoveries are not of German origin. What of the steam engine, the compass, the telegraph, the telephone, the aeroplane, even the submarine—the list might be indefinitely extended. Science is the exclusive property of no nation; its functions are normally beneficent; its devotees seek the welfare of the race, and not personal or national aggrandizement. Did we have patents on the medicinal uses of quinine, the iodides, the employment of anesthetics and antiseptics? No, we left the patent medicine business to charlatans in this country and German scientists abroad, and both fattened on our good nature and our dollars. (Editorial by Dr. V. C. Vaughan, *Journal of Laboratory and Clinical Medicine,* Dec., 1917.)

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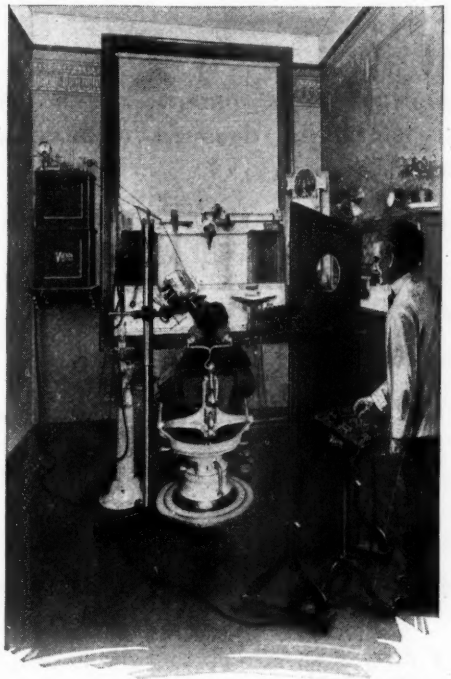

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